AMERICAN
MANAGEMENT
SYSTEMS, INC.

EXISTING CAPABILITIES

for the

Bureau of Land Management

ADP Modernization Project

Contract AA852-CT5-15

June, 1986

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1. INTRODUCTION

1.1 Overview and Purpose

This document identifies the Bureau of Land Management's existing automated data processing (ADP) facilities and the available workload currently processed by those faclilties. This analysis is the second major deliverable produced under American Management Systems' contract to support BLM's ADP Modernization Project, a multi-year effort to improve the Bureau's ADP capabilities.

The Bureau has about 10,000 employees located in the Washington Office (WO), the Denver Service Center (DSC), the Boise Interagency Fire Center (BIFC), twelve State Offices, fifty-five District Offices, and 153 Resource Area Offices. The Bureau has a yearly operating budget of approximately $500,000,000 and generates revenues and receipts amounting to approximately $205,300,00.

To upgrade its ADP capabilities, BLM has initiated the ADP Modernization Project, managed by the Division of Information Resources Management (WO-770). This project is intended to accomplish the following objectives:

- Define BLM's current and future functional requirements for ADP and data communications support.
- Document the capabilities of BLM's current hardware and software and analyze any deficiencies in meeting current and future requirements.
- Identify the most efficient and cost-effective ADP hardware, software, and data communications configuration based on a cost/benefit analysis of alternative concepts.

- Prepare a configuration management plan with which to control the acquisition and management of any needed hardware, software, and communications capabilities.

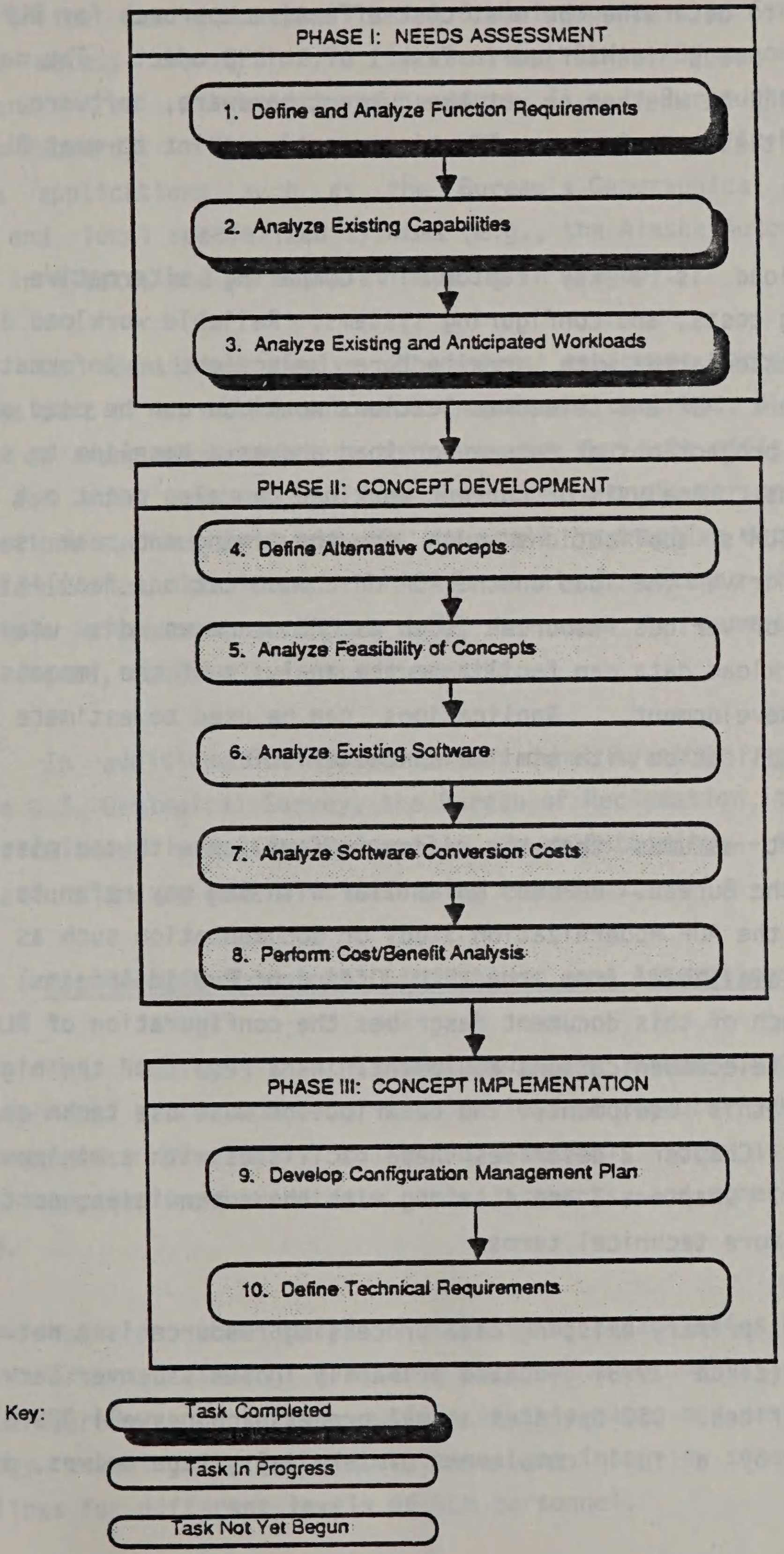
- Specify the technical requirements for any new ADP technology that BLM may elect to procure.

Figure 1-1 depicts the tasks to be performed under AMS's contract. Current plans are to complete these tasks by the end of Fiscal Year 1987, with new ADP equipment being installed beginning in approximately 1989.

The outcome of this effort will be a hardware, software, and telecommunications infrastructure which will support administrative, case related, land record, and geographic information systems. Office automation systems are explicitly excluded. In general terms, this effort addresses all systems currently running on the DSC Honeywell DPS 8/70 system and on the State Office Honeywell Level 6 minicomputers, as well as Case Recordation, ALMRS, and GIS applications, regardless of the computers used to support these applications, and any new ADP applications such as the enhanced ALMRS application. Excluded are applications running on Wang OIS and Wang PCs, even when these applications have strong characteristics of traditional ADP systems. In addition, this study excludes special-purpose scientific equipment (e.g., cadastral survey calculators, lightning strike sensors, etc.) that may in fact contain microcomputers.

The first step in the ADP Modernization Project was to identify BLM's functional needs for ADP and data telecommunications support, i.e., the uses of the technology that will support BLM's missions and objectives. This, the second step in the project addresses two topics: cataloging BLM's current inventory of ADP hardware, software, and telecommunications facilities (computers, applications software, communications lines, etc.) and identifying the workload currently handled by those facilities. This information will play a major role in subsequent analyses of alternative approaches and cost estimation.

Figure 1-1. AMS has begun work on all three Needs Assessment Tasks.


PHASE I: NEEDS ASSESSMENT
1. Define and Analyze Function Requirements
2. Analyze Existing Capabilities
3. Analyze Existing and Anticipated Workloads
PHASE II: CONCEPT DEVELOPMENT
4. Define Alternative Concepts
5. Analyze Feasibility of Concepts
6. Analyze Existing Software
7. Analyze Software Conversion Costs
8. Perform Cost/Benefit Analysis
PHASE III: CONCEPT IMPLEMENTATION
9. Develop Configuration Management Plan
10. Define Technical Requirements
Key:
Task Completed
Task In Progress
Task Not Yet Begun

BLM's current inventory of ADP and telecommunications resources is the starting point to determine the most cost effective approach for BLM to follow to meet the needs identified in Task 1 of this project. The major focus of Task 3 will be whether or not the current hardware, software, and communications facilities provide an effective starting point to meet BLM's future needs.

System workload is a key factor in comparing alternative ADP approaches, estimating costs, and configuring systems. Reliable workload data reduces the risk associated with architecture selection. Information concerning the current ADP and telecommunications workload can be used as a baseline to develop projections of future workload and as a baseline to size initial configurations. Analysis of current workload can also point out key characteristics of BLM's applications such as the timing and peak usage, applications which "drive" the load on the ADP or communications facilities, and the relative use of various resources (such as CPU usage vs. disk usage). Finally, current workload data can facilitate the analysis of the impacts of future application development. Applications can be used to estimate the workload of the new application with similar characteristics.

This document assumes that the reader is familiar with the mission and organization of the Bureau. Readers unfamiliar with BLM may refer to the Task 1 deliverable of the ADP Modernization Study or documentation such as the BLM Annual Report (available from the BLM Office of Public Affairs) for further detail. Much of this document describes the configuration of BLM's current computer and telecommunications equipment. As a result of the highly technical nature of this equipment, the descriptions must use technically acurate terminology. Chapter 2 describes these facilities with a minimum of technical terminology. Chapters 3 and 4, along with the appendicies, contain descriptions that use more technical terms.

The Bureau's primary existing data processing resource is a network of aging computers (circa 1978) located primarily in BLM's Denver Service Center and in State Offices. DSC operates a dual processor Honeywell DPS 8/70 mainframe, supported by a full complement of terminals, tape drives, disk drives, printers, communications processors, and other equipment. Each BLM State Office has a Honeywell Level 6 minicomputer used for local processing and to access the DPS 8/70 in Denver. BLM's ADP resources also include computers from a variety of vendors (i.e., Burroughs, Data General, Hewlett-Packard). These systems usually support specific District and State Offices applications such as the Bureau's Geographical Information System (GIS) and local specialized systems (e.g., the Alaska Automated Land Records System in Alaska, and forest plat mapping in Oregon).

We identified twelve PC vendors' equipment currently in use within BLM. As part of an office automation equipment contract, BLM acquired a large number of Wang microcomputers that are used for both office automation tasks such as word processing, and for traditional personal computer (PC) applications such as spread sheets and small interactive databases. Recently, BLM standardized on the Philips Personal Computers; these are IBM PC compatible microcomputers that will be used for general PC applications, spread sheets, interactive databases, etc.

In addition, BLM uses computers owned by other organizations -- such as the U.S. Geological Survey, the Bureau of Reclamation, the U.S. Department of Agriculture, and the Bonneville Power Authority -- to support specific applications and as general timesharing resources.

1.2 Approach, Methodology, Limitations, and Assumptions

The findings in this document are based on interviews with BLM managers and staff combined with reviews of computer perfomance evaluation (CPE) manuals, previously collected materials such as the Oak Ridge Labs study, computer system outputs, annual reports, and other materials provided by BLM.

Work on the analysis of existing capabilities began in October of 1985. After reviewing available background documentation, the AMS project team prepared a tentative outline of this paper and developed an interview strategy covering target interviewees, an interview schedule, and interview guidelines for different levels of BLM personnel.

AMS conducted interviews in BLM's Denver Service Center (DSC) during October of 1985. Interviews were generally scheduled in a "top-down" sequence, starting with the DSC Director, and the three Deputy Directors, and continuing with managers and personnel in each branch. After analyzing the preliminary information gathered during this visit, a followup visit was made in December of 1985 to gather additional, detailed data. Prior to finalizing this document an additional trip to DSC was made in April 1986.

In addition to interviews at DSC, AMS teams visited four states: Colorado, Eastern States, Montana, and Oregon. During these visits, AMS interviewed Information Resources Management (IRM) management and staff, along with users at the State Office, District Office and Resource Area office levels.

During the interviews at DSC and in the field, we collected information on ADP systems in current use, detailed hardware configurations, and available resource usage. For many systems, accurate workload information was not available.

Phone surveys were made to State and field offices that were not visited to obtain information on ADP inventory and usage (generally in the form of estimates).

The structure and content of this document have been designed to meet the needs of the ADP Modernization Project while remaining within the project's schedule and budget. In particular, the ADP Modernization Project is a strategic planning effort -- its purpose is to define the best overall ADP architecture for the Bureau, not to analyze individual application systems in detail. Readers should therefore be aware of several limitations of this document:

- This analysis covers major ADP hardware and software systems with a significant impact on the Bureau's ADP environment -- it does not address every individual piece of ADP equipment. Details of specific hardware and software systems can only be correct as of a specified time. Inventories which were not dated have been given the date upon which they were received. In an organization the size of BLM, applications and equipment are added and upgraded on a continuing basis, rendering a detailed inventory obsolete overnight. AMS addressed the analysis to strategic needs, rather than risking drowning in specifics.

- **The ADP systems in this document are described at an extremely aggregate level.** In order to support overall ADP and hardware planning and analysis, our review of each ADP configuration provides basic, not detailed, information of the system's scope and usage.

- **Current ADP systems do not support all of BLM's functional needs.** Some of the functional requirements identified in Task 1 are not currently supported by ADP systems. In some cases a manual system continues to be most cost effective; in other cases, applications have been planned to meet requirements not now automated.

- **Some ADP functional requirements are supported by multiple computer systems, making differentiation of workload by application for each system impossible.** In some cases, a single BLM function requirement might be best supported by several sets of ADP capabilities -- such as case tracking, spatial graphics, and management decision support. In other cases, a single system (e.g., the Case Recordation System or ORCA) may support many BLM functions, using state operated Level 6 systems in concert with the DSC DPS-8 system. Future system implementations may increase the use of networks of multiple computer systems which will aggravate this situation.

- **Comprehensive, accurate usage statistics are available for only a few BLM systems.** Automated usage statistics are available on a limited basis for the DSC systems, and are not available for the systems operated by the State and District offices. Detailed usage information is only available for approximately one seventh of BLM's total ADP capacity. The lack of usage statistics, combined with our observation that no state is "average," causes serious limitations on the advisability of extrapolating the usage patterns to all BLM systems. Because workload statistics are a key input into future ADP Modernization Project tasks, we are continuing our efforts to collect accurate statistics for cases where sufficient information is not currently available.

- **Some computer systems may be in use within BLM without being included in this inventory.** While AMS has made every attempt to identify all computer systems in use within BLM, it was not practical to visit all BLM offices for a physical inventory. It is possible that some unidentified computer systems are in operation in the eight states that were not visited.

- **We have not attempted to document in detail the ADP use of office automation equipment.** BLM's field offices differ in the ways that they use office automation equipment; some use the OA equipment solely for OA tasks, other perform significant ADP processing using packages such as Lotus 1-2-3, Dbase III, and Condor.

- **This document is not intended to cover requirements for office automation.** BLM has contracts in place to meet its needs for word processing equipment and microcomputers. This paper does not attempt to define how many or what type of office automation systems might be needed by each BLM office. Technical analyses to be performed later in the project will take account of the needs for interfaces between ADP and office automation equipment.

1.3 Organization of this Document

In addition to this introduction, this document is divided into four chapters and seven appendicies:

- **Chapter 2, Overview.** Chapter 2 summarizes the most important results of the existing capabilities analysis and their implications for subsequent tasks in the project.

- **Chapter 3, Current BLM System Inventory.** Chapter 3 summarizes BLM's existing hardware and telecommunications inventory. It provides information on each major computer system, whether located at DSC or in the States. This overview is designed to provide a comprehensive view of the total ADP configuration in use within BLM. It is not intended to provide detailed information on individual hardware or software components. Detailed ADP equipment inventories are included in Appendix A.

- **Chapter 4, Capacity and Utilization of Current Systems.** Chapter 4 contains information on the utilization of the systems described in Chapter 3.

- **Appendicies A, B, C, D, E F, and G.** The appendicies contain detailed supporting material for the chapters.

    - Appendix A - detailed ADP equipment inventories for each BLM office

    - Appendix B - information on each of the current Bureau-wide application systems

    - Appendix C - schematic diagrams of the current BLM data communications network

    - Appendix D - a list of the sources consulted during this task

    - Appendix E - the results of the telephone survey of BLM field offices

    - Appendix F - an analysis of the use of Bureau-wide applications by each state office

    - Appendix G - provides disk and channel statistics for the largest disk drives and the four busiest channels

2. OVERVIEW

2.1 Introduction

This chapter provides an overview of BLM's existing ADP and data telecommunications facilities and the workload being processed by those facilities. Section 2.2 summarizes the major findings of this analysis. Section 2.3 describes BLM's overall organizational structure. Sections 2.4, 2.5, 2.6, 2.7, and 2.8 respectively, describe the existing ADP management structure, ADP installations, telecommunications network, applications, and capacity and utilization.

2.2 Conclusions and Observations

The major conclusions of our analysis of BLM's existing ADP and telecommunications capabilities are as follows:

- **BLM's current ADP facilities include many different (and largely incompatible) components.** We identified over 140 vendors who provide equipment to BLM not counting of office automation or outside services. Even by vendor there are many different models and versions in use. Most of the various operating systems, terminals, communications protocols, etc. in use are vendor specific and incompatible. This situation obviously complicates providing support, training, maintenance, software development, procurement, planning, etc.

- **Much of the equipment in place today is not current technology.** The Honeywell mainframe and minicomputer have not been marketed for several years. Some of the operating systems now used have been superceded. Much of the applications software was directly converted from batch programs running on the Burroughs mainframe that preceded the DPS-8. The current network design has many single points of failure.

- **The applications supported by the ADP systems are becoming more distributed, more directly driven by user needs, and more oriented to mission support.** Program offices increasingly require the use of automation as a management tool. Computers (sometime in the form of personal computers or office automation equipment) are being installed in more and more locations. Users are developing applications using timesharing facilities or local computers. Large applications such as GIS and ALMRS are being developed, shifting the processing from administrative applications to more program oriented applications. However administrative processing will continue to use centralized ADP as a management tool.

- **There is little system workload information available.** The only machine-collected workload statistics available are for the DPS-8 (which accounts for approximately 14% of BLM's installed processing capacity) and the Burroughs computers in the Alaska State Office. Software has been developed to collect statistics for the Level 6s but it is only now being installed. Even the software on the DPS-8 does not collect some of the statistics needed for capacity planning. No "hard" statistics are available for the other computers in BLM or the telecommunications network.

- **Some additional capacity exists on the network of Honeywell computers.** The DPS-8 and the Level 6s appear to be only lightly used during non-prime shift hours. Additional disk storage capacity could probably be made available for the DPS-8 by archiving some of the less frequently used data now stored on the disks. Of the permanent disk space used, 17% has not been used in 180 days.

Figure 2-1. BLM's Washington Office organization.

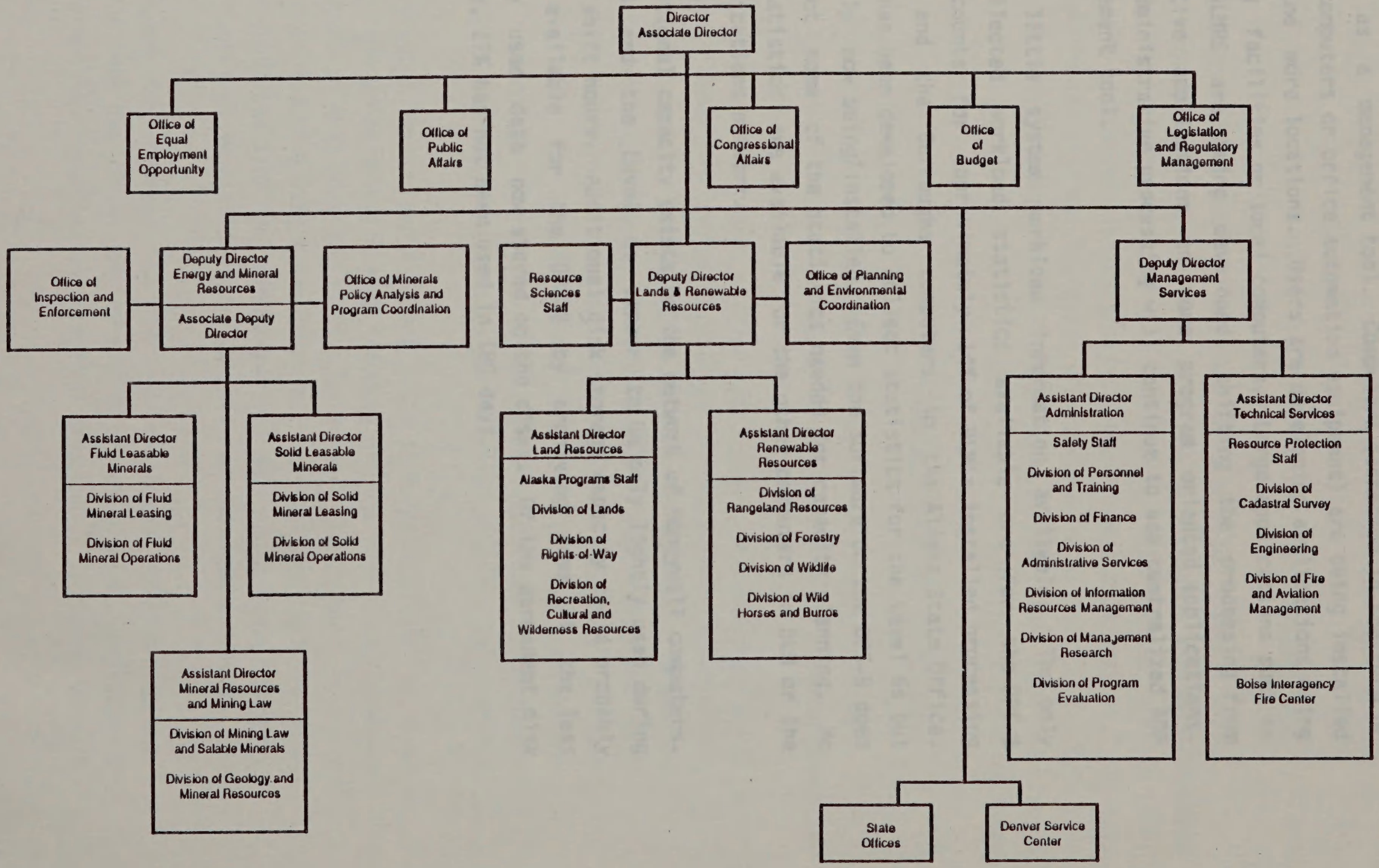

Director
Associate Director
Office of Equal Employment Opportunity
Office of Public Affairs
Office of Congressional Affairs
Office of Budget
Office of Legislation and Regulatory Management
Office of Inspection and Enforcement
Deputy Director Energy and Mineral Resources
Associate Deputy Director
Office of Minerals Policy Analysis and Program Coordination
Resource Sciences Staff
Deputy Director Lands & Renewable Resources
Office of Planning and Environmental Coordination
Deputy Director Management Services
Assistant Director Fluid Leasable Minerals
Division of Fluid Mineral Leasing
Division of Fluid Mineral Operations
Assistant Director Solid Leasable Minerals
Division of Solid Mineral Leasing
Division of Solid Mineral Operations
Assistant Director Mineral Resources and Mining Law
Division of Mining Law and Salable Minerals
Division of Geology and Mineral Resources
Assistant Director Land Resources
Alaska Programs Staff
Division of Lands
Division of Rights-of-Way
Division of Recreation, Cultural and Wilderness Resources
Assistant Director Renewable Resources
Division of Rangeland Resources
Division of Forestry
Division of Wildlife
Division of Wild Horses and Burros
Assistant Director Administration
Safety Staff
Division of Personnel and Training
Division of Finance
Division of Administrative Services
Division of Information Resources Management
Division of Management Research
Division of Program Evaluation
Assistant Director Technical Services
Resource Protection Staff
Division of Cadastral Survey
Division of Engineering
Division of Fire and Aviation Management
Boise Interagency Fire Center
State Offices
Denver Service Center

Figure 2-2. Most of BLM's personnel and operations are in its field offices.

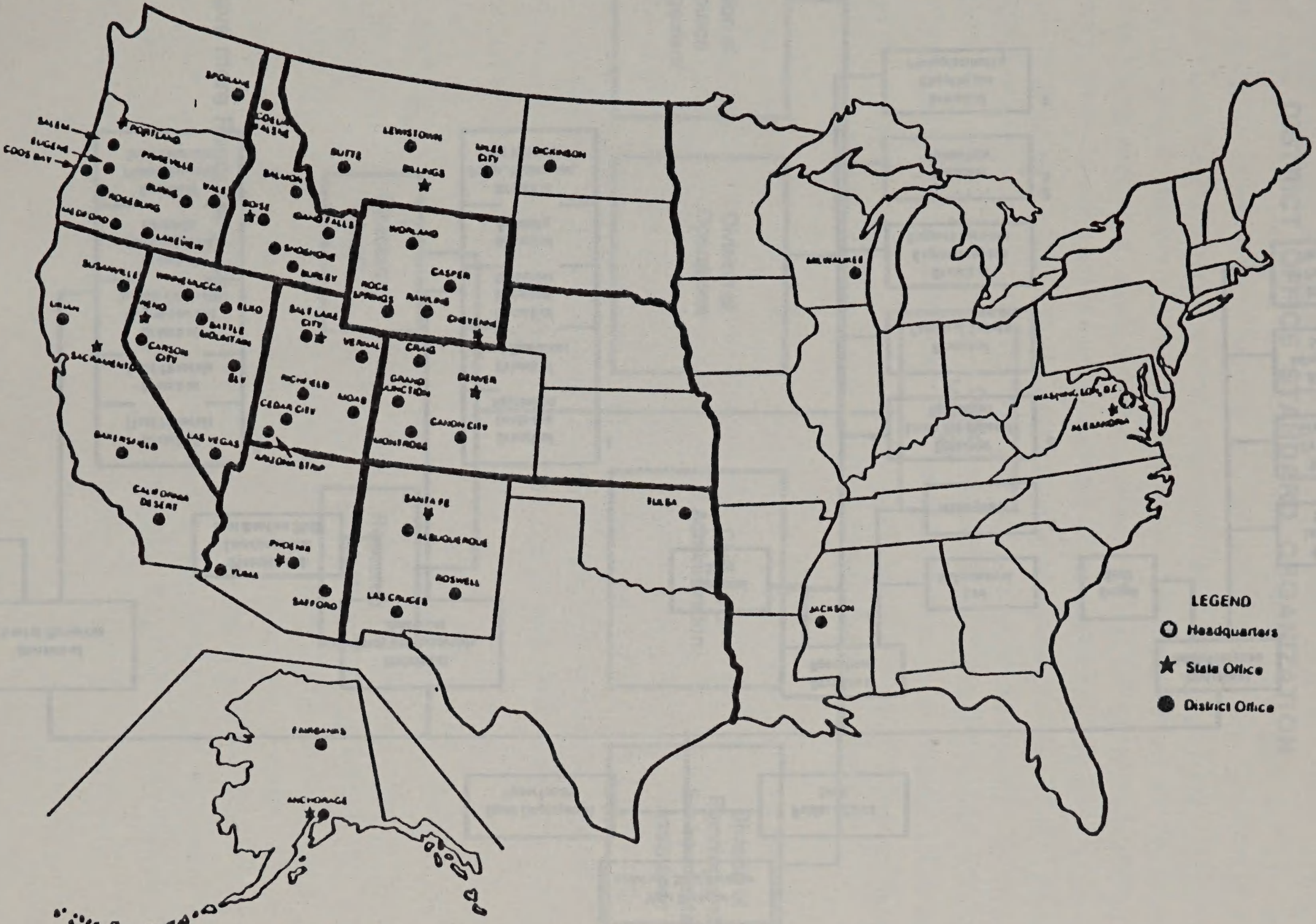
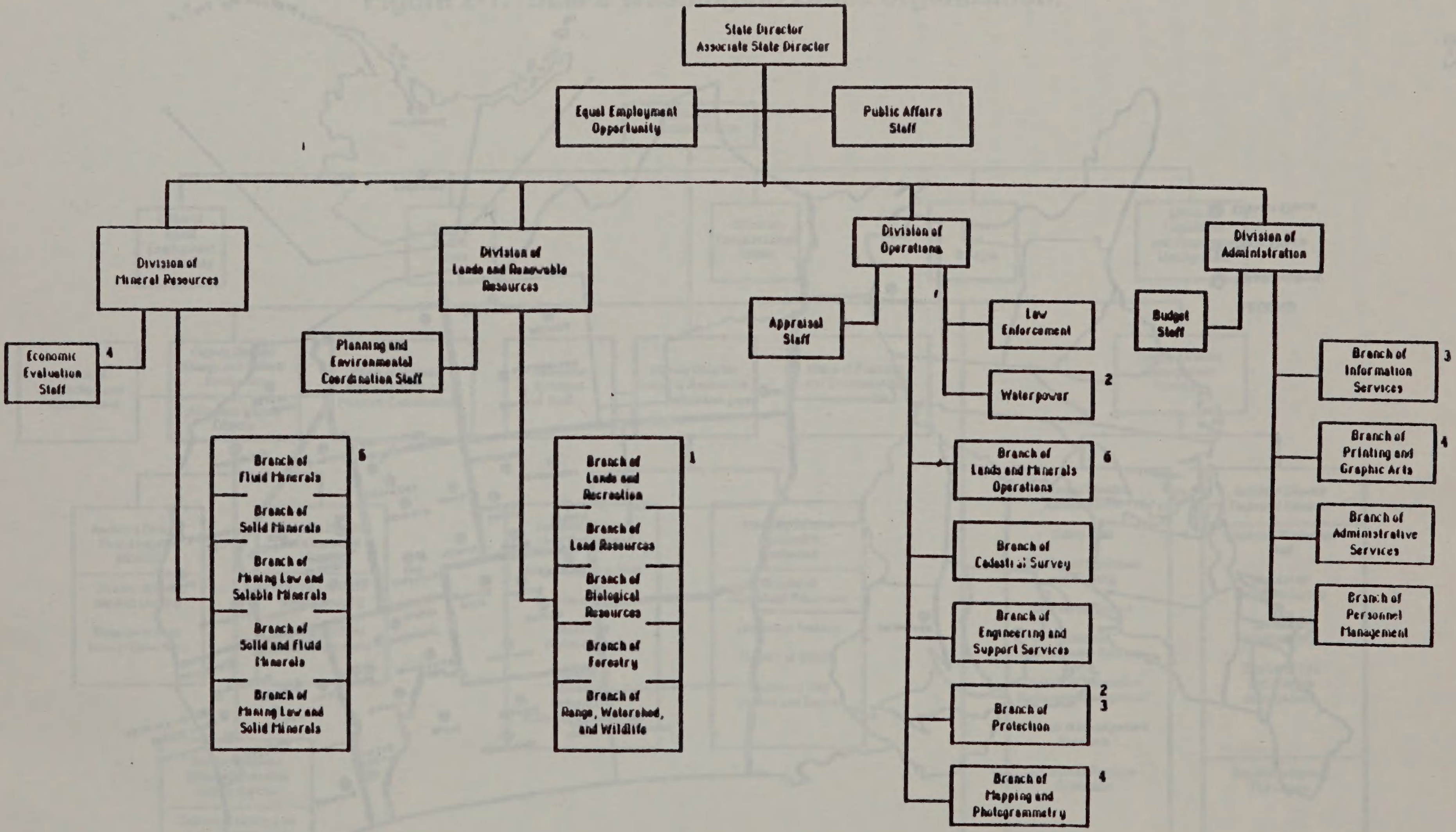


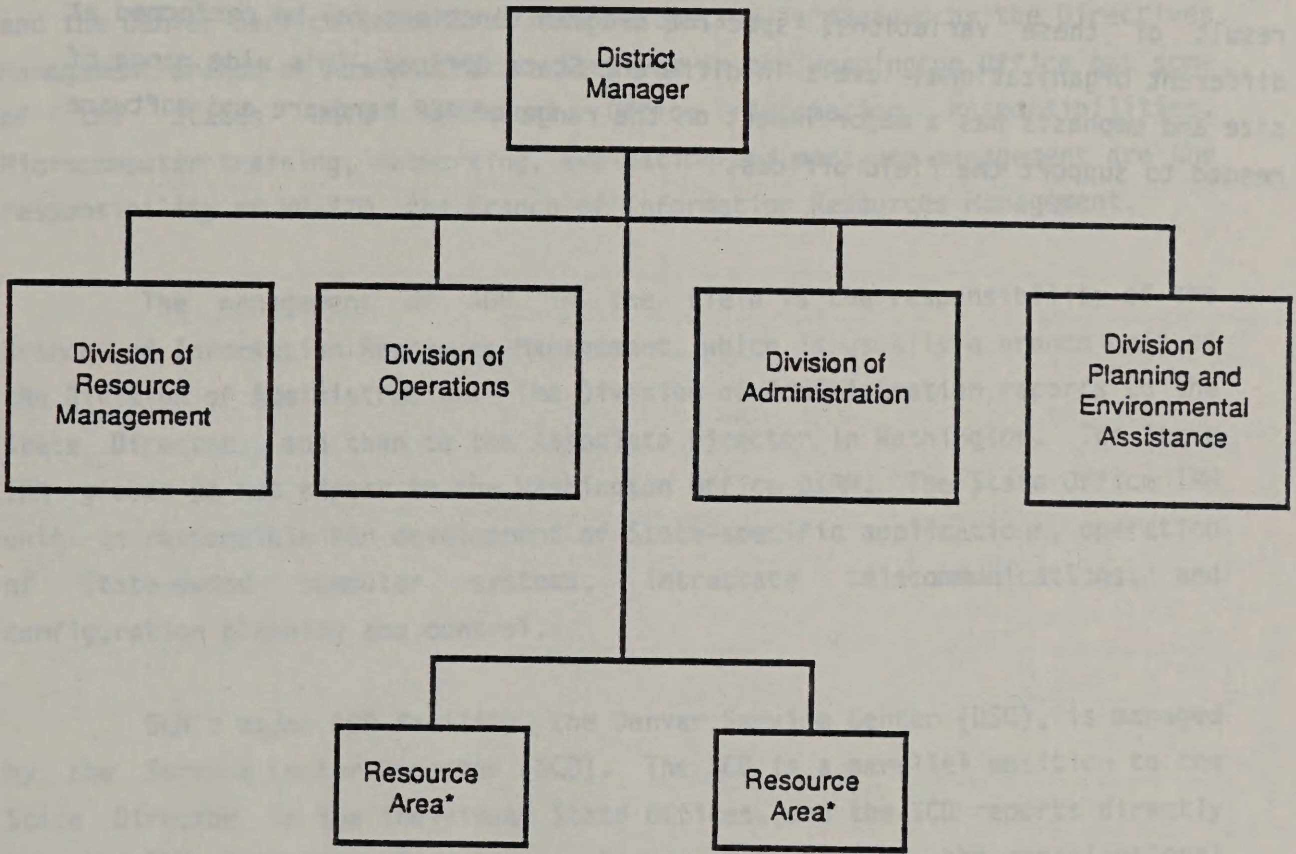
Figure 2-3. BLM's Field Office organization.


State Director
Associate State Director
Equal Employment Opportunity
Public Affairs Staff
Division of Mineral Resources
Economic Evaluation Staff
4
Branch of Fluid Minerals
5
Branch of Solid Minerals
Branch of Mining Law and Salable Minerals
Branch of Solid and Fluid Minerals
Branch of Mining Law and Solid Minerals
Division of Lands and Renewable Resources
Planning and Environmental Coordination Staff
Branch of Lands and Recreation
1
Branch of Land Resources
Branch of Biological Resources
Branch of Forestry
Branch of Range, Watershed, and Wildlife
Division of Operations
Appraisal Staff
Law Enforcement
Waterpower
2
Branch of Lands and Minerals Operations
6
Branch of Cadastral Survey
Branch of Engineering and Support Services
Branch of Protection
2
3
Branch of Mapping and Photogrammetry
4
Division of Administration
Budget Staff
Branch of Information Services
3
Branch of Printing and Graphic Arts
4
Branch of Administrative Services
Branch of Personnel Management

1- MAXIMUM OF 3 BRANCHES PER STATE FROM THOSE LISTED
2 OPTIONAL OTHERWISE INCLUDE FUNCTIONS IN BRANCH OF ENGINEERING AND SUPPORT SERVICES
3- MAY BE DESIGNATED AS BRANCH OR STAFF
4 OPTIONAL
5 MAXIMUM OF 4 BRANCHES PER STATE FROM THOSE LISTED
6 OPTIONAL OTHERWISE INCLUDE FUNCTIONS IN DIVISION OF MINERAL RESOURCES
AND DIVISION OF LANDS AND RENEWABLE RESOURCES

Figure 2-3 (Continued)

DISTRICT OFFICE STANDARD ORGANIZATION


District Manager
Division of Resource Management
Division of Operations
Division of Administration
Division of Planning and Environmental Assistance
Resource Area*
Resource Area*

* May have more Resource Areas.

BLM's field offices vary substantially in size and emphasis. Some Districts -- Medford, Oregon, for example -- are as large as many State Offices; similarly, some Resource Area Offices are almost as large as small Districts, although most have no more than a dozen personnel. Because of differences in the resources found on Federal land in various areas, different State Offices stress different programs. For example, the forestry program is extremely large and important in Oregon, whereas energy and minerals exploration and development are most critical in Wyoming and New Mexico. As a result of these variations, specific program functions may be performed at different organizational levels in different State Offices. This wide range of size and emphasis has a major impact on the range of ADP hardware and software needed to support the field offices.

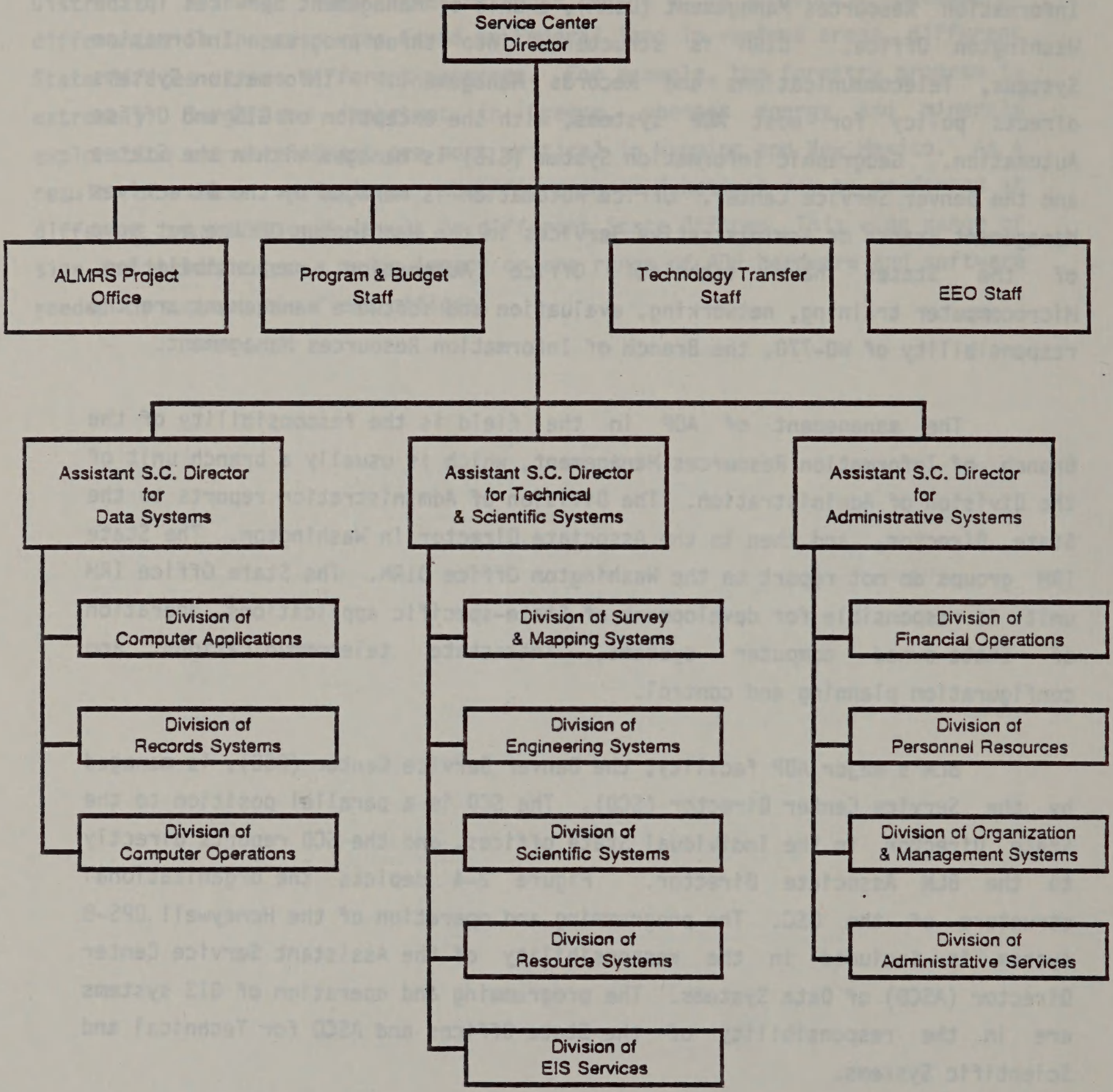
2.4 BLM ADP Management Structure

Bureauwide ADP policy is the responsibility of the Division of Information Resources Management (DIRM), a unit of Management Services in the Washington Office. DIRM is structured into three programs: Information Systems, Telecommunications and Records Management. Information Systems directs policy for most ADP systems, with the exception of GIS and Office Automation. Geographic Information System (GIS) is managed within the States and the Denver Service Center. Office Automation is managed by the Directives Management Branch of Administrative Services in the Washington Office but some of the States have technical Office Automation responsibilities. Microcomputer training, networking, evaluation and software management are the responsibility of WO-770, the Branch of Information Resources Management.

The management of ADP in the field is the responsibility of the Branch of Information Resources Management, which is usually a branch unit of the Division of Administration. The Division of Administration reports to the State Director, and then to the Associate Director in Washington. The State IRM groups do not report to the Washington Office DIRM. The State Office IRM unit is responsible for development of State-specific applications, operation of State-owned computer systems, intrastate telecommunications, and configuration planning and control.

BLM's major ADP facility, the Denver Service Center (DSC), is managed by the Service Center Director (SCD). The SCD is a parallel position to the State Director in the individual State offices, and the SCD reports directly to the BLM Associate Director. Figure 2-4 depicts the organizational structure of the DSC. The programming and operation of the Honeywell DPS-8 system is included in the responsibility of the Assistant Service Center Director (ASCD) of Data Systems. The programming and operation of GIS systems are in the responsibility of the State Offices and ASCD for Technical and Scientific Systems.

Figure 2-4. Denver Service Center Organizational Chart.*


Service Center Director
ALMRS Project Office
Program & Budget Staff
Technology Transfer Staff
EEO Staff
Assistant S.C. Director for Data Systems
Assistant S.C. Director for Technical & Scientific Systems
Assistant S.C. Director for Administrative Systems
Division of Computer Applications
Division of Records Systems
Division of Computer Operations
Division of Survey & Mapping Systems
Division of Engineering Systems
Division of Scientific Systems
Division of Resource Systems
Division of EIS Services
Division of Financial Operations
Division of Personnel Resources
Division of Organization & Management Systems
Division of Administrative Services

* As of 2/86.

The BLM ADP process is also guided by committees. The Information Systems Steering Committee provides oversight and management responsibility for ongoing systems-related efforts. Membership includes Deputy Directors, Assistant Directors, Chief, Division of Information Systems. The Field Committee provides field level management advice and leadership for implementing the strategic plan and other programs for Information Systems management. Membership includes Associate State Directors; BLM Deputy Director, BIFC; Chief, Division of Information Systems; Assistant Service Center Director for Data Systems and the Co-chairman of the IRM-TAC. The Information Resource Management - Technical Advisory Committee (IRM-TAC), composed of the State Office Chief, Branch of Information Services, with WO and DSC representation, coordinates and provides technical advice and recommendations to the Washington Office (770) on information systems work.

2.5 Existing ADP Installations

BLM operates 16 computer facilities: three located at DSC, one at each of the 12 State Offices, and one at BIFC. These facilities include the network of Honeywell mainframe and mini computers as well as computers used for Geographic Information System (GIS) support. In addition to these facilities, users within the Bureau use significant ADP resources that are separate from the main Honeywell computer network and the systems that support GIS. Some are specialized mini and micro computers distributed to selected District and Resource Area offices. Other resources are available from other government and commercial facilities on a timesharing or shared basis.

BLM operates more than 40 systems which are "mini-computer" size or larger, supporting more than 1000 terminals and users at more than 100 locations. AMS has identified more than 140 vendors of ADP equipment who have at least one hardware device installed at BLM.

The heart of the BLM ADP capability is a network of Honeywell computers. This network is used for all BLM-wide applications, and a significant portion of the program specific applications developed by State Office IRM staff and other staff at various BLM field offices. The network consists of a dual processor Honeywell DPS-8 system at DSC connected via high speed communications links to the Honeywell Level 6 systems located in each State Office. Terminals connected to the Level 6 can execute applications on both the local Level 6 and the central DPS-8 system.

The DPS-8 system consists of two Honeywell 8/70 CPUs rated at approximately 1.7 million instructions per second (MIPS) each, two megawords of 36-bit memory, four communications front-end processors, 49 disk drives holding 36,700 megabytes of data, and an assortment of tape drives, line printers, card readers etc.

As important to the Honeywell network as the mainframe are the distributed processors, the Level 6 systems located in each State Office. The Level 6 product line consists of a family of 16-bit computers capable of simultaneously processing local applications and perform network functions such as remote terminal concentration, file transfer, and remote printing. In early 1981, the Level 6 family was superseded by Honeywell's DPS-6 line of 32-bit systems, which provide superior functionality and flexibility while costing less to buy, maintain, and operate.

2.6 Existing Telecommunications Network

BLM operates a hardware based, nationwide telecommunications network linking the Honeywell, Data General and Bureau of Reclamation (BOR) CYBER computers together, and providing access to BLM and other computers to users located in BLM field offices. Dedicated high-speed lines connect DSC to each State Office. This portion of the network is managed by DSC. Within the control of each State, an intrastate network provides links to District and Resource Area offices. For a more detailed description of BLM's network, please see Section 3.10. For specific details of State, District, and Resource Area connections, please see Appendix C.

The architecture of the BLM telecommunications network causes the path of access from a user in a District or Resource Area office to have many potential "single point of failure" components. That is, the network relies upon a chain of switching equipment, modems, multiplexors, and long distance phone links, where the failure of any single point will cause the attempted communication to fail. Unreliable telephone service in remote locations contributes to the problem. During interviews with BLM field office personnel, AMS was repeatedly told that communications failures or bottlenecks occurred at a rate high enough to cause user frustration. (eg. Colorado reported 50% downtime over a two week period due to lightning damage, and had continuous trouble with noise during data transmission in Grand Junction. Montana reported telecommunications bottlenecks at Miles City. Oregon, Montana and Colorado reported frequent trouble with dropped lines during report transmission. Transmission of one GIS report blocked a queue for one and a half days in Colorado.)

2.7 Existing Application Systems

All Bureau-wide applications are operated on the Honeywell computer network. Most run entirely on the DSC DPS-8 system, with some using both the State Office Level 6s and the DSC DPS-8. GIS, while not literally bureau-wide is in use in six states, is supported by DSC, and runs on Data General mini-computers located in the states.

A large number of bureau-wide applications are written in COBOL and were converted without redesign from the batch-oriented Burroughs when the Honeywell Level 66 was installed. Most rely on physical transfer of paper forms from the field to DSC, where the data is transfered to disk using the CMC key-to-disk system. Very few provide online access or use a database management system.

Typical bureau-wide applications include all of BLM's financial management systems (i.e. accounts payable, general ledger, budgeting), Case Recordation, and Range Management Automated System. For a detailed description of BLM's application systems, please see section 3.5.1.4 and Appendix B.

2.8 Capacity and Utilization

The total processing capacity of BLM's systems identified in this analysis is approximately 30 MIPS (million instructions per second). System generated workload and communications data is currently available for the DPS-8 and Level 6 systems in the Denver Service Center (DSC), the Burroughs B-4800 and B-2700 systems in Alaska and on Data Generals. All remaining systems do not collect the utilization statistics needed to assess workload. In addition, there is no monitoring of data communications traffic.

The software tools currently available on the DPS-8 and the Level 6s were not designed to monitor hardware component utilization and therefore do not provide usage data necessary to accurately monitor the key ADP workload measures, to do accurate system component sizing, or to provide statistics usually included in ADP RFPs. As a result, our analysis of BLM's current workload is based largely on estimates provided by BLM systems personnel.

It is not possible to characterize the overall workload of the current systems. We found that some components appear to have considerable unused capacity while others are operating at capacity. Chapter 4 discusses the workload of the major system components.

Workload data available for the DPS-8 does confirm our conclusion (described in the Task 1 document) that there is no typical state office, as utilization of the DPS-8 by the States is not uniform. For example, the data indicates that of all the DPS-8 processing used by Montana, 90% was for Mineral Management applications. Conversely, Oregon used almost 100% of its processing for Oil and Gas applications. This data may not be totally correct, however, as it is based on the charge codes entered by the system users. If erroneous charge codes were entered, the results could be misleading.

3. CURRENT BLM SYSTEM INVENTORY

3.1 Introduction

This chapter describes BLM's current inventory of ADP hardware, software, and data communications facilities at the Denver Service Center and the field offices. The inventory includes equipment, systems software, application software, telecommunications networks, and ADP support staff. It provides a baseline configuration against which alternative configurations will be compared in subsequent ADP Modernization Project tasks. Refer to Appendix A, Detailed ADP Inventory, for a detailed analysis of BLM's ADP facilities.

The organization of Chapter 3 is based on the five categories of ADP capability used by BLM which are: the Honeywell computer network, the Geographic Information System (GIS), Office Automation, other computers run by BLM, and outside agency ADP support. Section 3.4 provides a brief review of BLM's ADP capability from a different but very important perspective -- the physical location of the systems. This discussion is elaborated on in Appendix A. Section 3.5 describes the Honeywell computer network at DSC and in the State Offices. Section 3.6 describes the Geographic Information System (GIS) computers in DSC and the State Offices. Section 3.7 addresses Office Automation and Personal Computers (PCs). Section 3.8 describes all other computers operated by BLM, and Section 3.9 describes other computer systems operated by outside agencies and commercial vendors. BLM's ADP telecommunications network is fully described in Section 3.10; this summarizes the complete network, although parts of the network are also described in earlier sections of this chapter as part of specific computer systems. Section 3.11 describes BLM's current portfolio of applications systems.

In support of Chapter 3, Appendix A provides a detailed analysis of the equipment inventory for DSC and each State Office, Appendix B contains functional summaries of the Bureau-wide application systems, and Appendix C contains schematic diagrams of the current BLM data communications network.

3.2 Observations and Conclusions

During this inventory effort, AMS made the following observations:

- **The technical ADP architecture of BLM is becoming increasingly decentralized.** The technical architecture of BLM systems has been slowly shifting from an exclusively centralized system capability in 1975 to a more decentralized architecture which currently includes minicomputers, Personal Computers (PCs), many different manufacturers' equipment, and the use of many outside ADP services. The State Offices received Honeywell Level 6 minicomputers in 1978-80 primarily to concentrate data entry from the District Offices and Resource Areas. Since then, the States have begun to establish user applications (such as ORCA) on the Level 6s. In the early '80s, some States received Data General minicomputers for fire applications and for Geographic Information Systems. This shift effects data transmission requirements, requirements for ADP capacity, distribution of ADP capacity, and ADP support requirements. Today the central DPS-8 mainframe computer located at the Denver Service Center accounts for approximately 14% of BLM's total installed processing capacity.

- **There is no "typical" State Office ADP inventory.** Since this shift in architecture was more a result of user demand than conscious design and since there is considerable variation in operations emphasis among State Offices, each State Office adapted its systems to meet its users' needs in its own way. Although all the State Offices have Level 6s which can be used similarly, States often use ADP equipment, software, and outside services not used by other States or used less extensively. This is consistent with BLM's overall philosophy of tailoring State Office activities and resources to localized needs, as it has successfully done with resource management programs.

- **A large number of ADP and telecommunications equipment vendors and models are used throughout BLM.** BLM has over 130 different vendors for ADP and telecommunications equipment. BLM operates: 70 different models of terminals; 20 major processor product lines; 76 different models of peripherals such as digitizers plotters, and printers. About half of these terminal and peripheral models (68 of the 144 models) exist in only one BLM location, though not the same location. Of the 14 major ADP sites in BLM, 10 sites had terminals or peripheral models not reported by any other BLM site; no model of terminal or peripheral was reported in more than 10 sites. Twenty-five models of printers were reported, eight of them in the same State Office. Applications software performing the same function was developed on different, incompatible machines. BLM operates microcomputers from 20 microcomputer vendors, some of which have more than one model at BLM. Proliferation of equipment types and vendors is expensive; it complicates support such as training, supplies, contract administration, and maintenance; it hinders efficient application development and communications.

- **There are few standards for ADP equipment and software.** Products from large number of vendors are used throughout BLM. A variety of incompatible operating systems are in use (which reduces the opportunity for sharing applications software or data). A variety of vendor specific communications protocols are used. This restricts the BLM staff. For example, a soil scientist would not be able to access soil information on multiple processors from one terminal, but would have to log on to each processor separately and then manually combine the results.

- **A complete, accurate inventory of BLM's applications and ADP and telecommunications facilities is not available.** The inventories included in this study are based on data supplied to Oak Ridge National Laboratories and the results of discussions with BLM staff and visits to BLM sites. There is no single, complete source of BLM ADP and telecommunications configuration data. Inventory frequently changes and data from some locations was not available. Due to the localized nature of many BLM applications, some may have been omitted from this inventory.

- **Much of BLM's ADP equipment and software is old.** The most widely used minicomputer in BLM, the Honeywell Level 6, has not been sold since 1983 and the version of the operating system used on BLM's Level 6s was superceded in September 1984. The operating system used in DSC on the Honeywell DPS-8 is GCOS III, the current Honeywell operating system is GCOS 8. Many Bureau-wide applications are batch COBOL programs that were translated from Burroughs to Honeywell COBOL without redesign. Most of the tape drives used in BLM are nine-track 1600 bytes per inch (BPI) density tape drives. For at least 10 years, 6250 BPI density drives have had wide acceptance. Currently available cartridge tape systems use much higher densities.

  The age of BLM's equipment and software prevents BLM from taking advantage of technology advances in equipment and applications software since many of these rely on improved equipment and operating system characteristics. It also makes maintenance and operations (electricity, air conditioning, etc.) more expensive and makes it difficult to hire and retain staff.

3.3 Existing Capability Categories

BLM uses a wide variety of computers, telecommunications, terminals and software to support its ADP needs. These systems can be grouped into five broad categories:

- The Honeywell computer network (the DPS-8 and Level 6s),
- Geographic Information System (GIS),
- Office automation and Personal Computers (PCs),
- Other computers run by BLM, and
- Other capabilities, such as computers run by outside agencies.

Figure 3-1 shows the categories related to BLM office locations. For some hardware, the boundaries of these categories are not rigidly defined. For example, a terminal can be used on both the Honeywell network and to access outside agencies and a personal computer can perform stand-alone processing, and act as a terminal to a larger host computer.

Combined, BLM has a total of 52 computers which are minis or larger. They have more than 30 gigabytes (30 billion characters) of on-line disk storage. They support over 1,000 terminals in more than 100 locations.

BLM uses a fairly large telecommunications network to support these five categories of computer systems and their users. The telecommunications network services supports three classes of use:

- Interactions between the member computers of the Honeywell computer network.
- Interstate access for low-speed terminals to the DSC DPS-8 and other computer systems, such as access to the Bureau of Reclamation for Pay/Pers processing. This access is managed by DSC.

Figure 3-1. BLM automated capabilities can be divided into five categories, distributed throught the organization.

	Honeywell Network	GIS	OA and PC	Other BLM Hardware	Outside Systems
DSC	●	●	●	●	●
WO	●		●	●	●
SO	●	●	●	●	●
DO	●		●	●	●
RA	●		●		●
BIFC	●		●	●	●

- Intrastate access for low-speed terminals to State Office computers and to the interstate network for access to other systems, managed by State Information Resource Branches.

These classes of service are supported by a heirarchical network using dedicated commercial phone lines, FTS, microwave channels and dial-up long distance phones.

The computers within the Honeywell network are the only systems within BLM that communicate on a formal computer-to-computer basis. All other computers are connected through the low-speed portions of the BLM telecommunications network. Because of the limitations of this low-speed, asynchronous interconnections, it is not practical to use the BLM network for sophisticated network applications, such as transfering data from one of Alaska's Burroughs systems to the Wyoming Hewlett-Packard HP1000.

Including the telecommunications network and the various systems in use within BLM, products from a large number of vendors are represented. Figure 3-2 lists over 130 different vendors identified from the inventory data we collected. Appendix A addresses the distribution of equipment in more detail.

BLM has approved procurements amounting to approximately $6,500,000 for Fiscal Year 1986. Figure 3-3 gives the FY 1986 approved procurement actions by hardware type, giving costs.

3.3.1 Honeywell Computer Network Category

The heart of the BLM ADP capability is a network of Honeywell computers. This network processes all BLM-wide applications, and a significant portion of the program specific applications developed by State Office IRM staff and non-ADP professionals at various BLM field offices. The network consists of a dual processor Honeywell DPS-8 system at DSC connected via dedicated communications links to the Honeywell Level 6 systems located in each State Office and BIFC. Terminals connected to the Level 6 can execute applications on both the local Level 6 and the central DPS-8 system.

Figure 3-2. BLM uses 130 ADP and telecommunications vendors

Vendor	ALASKA	ARIZONA	BIFC	CALIF.	COLO.	DSC	ESO	IDAHO	MONT.	NEVADA	NEW MEX.	OREGON	UTAH	WYOMING	OCCURENCES
3M			X												1
ADDS			X											X	2
AT&T									X	X					2
Altek				X	X				X						3
Altos		X													1
Anadex			X			X								X	3
Anderson-Jacobson						X	X	X		X		X	X		6
Apple		X								X					2
Applicon						X									1
Atlanthus		X						X	X	X		X			5
Bendix						X									1
Burroughs	X							X	X	X	X			X	6
C. Itoh			X												1
CFS Corp.								X							1
CPT			X												1
Calcomp					X	X						X	X	X	5
Codex		X				X	X	X	X			X	X	X	8
Compaq						X				X	X				3
Computer Devices						X									1
Computer Transceiver Systems					X	X		X					X		4
Comtal/3M						X									1
DATA South					X	X	X		X		X		X	X	7
Da Pro								X							1
Data 100						X									1
Data General	X	X	X	X	X	X			X		X	X		X	10
Data Point				X				X		X		X			4
Dest Corp.							X	X						X	3
Diablo				X		X									2
Digital			X	X		X		X	X		X	X	X	X	9
Digitech						X									1
Dunn Instruments						X			X						2
Dynatech			X												1
ESL Inc.						X									1
Elect. Dev. Inc.								X							1
Epicom						X									1
Epson			X					X			X	X	X		5
Execuport		X			X	X	X	X		X	X				7
Florida DATA					X	X	X		X						4
General Data Communications												X			1
General Electric						X		X		X		X			4
Halcyon		X						X			X				3
Hayes		X				X							X		3
Henco											X				1
Hewlett Packard	X	X	X			X						X			5
Honeywell	X	X	X	X	X	X	X	X	X	X	X	X	X	X	14
IBM				X	X	X	X	X	X	X	X	X	X	X	11
Int. Data Sci. Inc.							X	X					X		3
International Imaging Systems						X							X		2
Intertec				X	X			X				X	X	X	6
K & E						X									1
KAYPRO		X				X						X			3
KYBE						X									1
Kennedy						X									1

Figure 3-2. BLM uses 130 ADP and telecommunications vendors (continued)

Vendor	ALASKA	ARIZONA	WIEC	CALIF.	COLO.	DSC	ESO	IDAHO	MONT.	NEVADA	NEW MEX.	OREGON	UTAH	WYOMING	OCCURENCES
Leading Edge						X									1
Lear Siegler				X	X	X				X		X	X	X	7
Mannesmann Tally				X	X	X		X	X	X		X	X	X	9
Megatek		X													1
Micom						X				X					2
Microbec					X								X		2
Modcomp						X							X		2
Monroe								X							1
Moore						X									1
Nicolet/Zeta		X	X		X	X					X	X	X	X	8
Northern Telecom					X	X									2
Northstar		X	X												2
OCLC						X			X						2
Okidata		X						X	X						3
Omnidata												X			1
Osborne			X			X						X			3
Penril												X			1
Philips										X		X			2
Qume			X												1
Racal-Vidac															0
Radio Shack		X	X								X	X			4
Ramtek/Omron		X	X	X	X	X		X	X	X	X	X		X	11
Rixon						X					X	X			3
SOROC TECH Inc.						X									1
Science Acc.								X					X		2
Sikes												X	X		2
Sola								X							1
Spectral Data Corp.						X									1
Sperry-Univac						X									1
Star Micronics						X									1
Summa Graphics						X								X	2
System Ind.														X	1
T-Bar Inc.										X	X		X		3
Talos		X		X							X		X		4
Tandberg				X	X	X		X	X	X	X	X		X	9
Techtran Industries					X							X	X		3
Tektronix		X		X	X	X		X	X	X	X	X	X	X	11
Teletype			X			X		X						X	4
Televideo				X	X	X		X	X	X	X	X	X	X	10
Telex Computer Products						X									1
Texas Intruments	X		X	X	X	X		X	X	X	X	X	X	X	12
Topaz		X	X			X		X					X		5
Toshiba			X												1
Trendata						X									1
U.S. Robotics												X			1
Varco						X									1
Versalite			X												1
Visual			X		X	X					X	X	X		6
Wang		X		X		X		X	X		X	X	X	X	9
Western Telemetric													X		1
Wright Line								X							1
Xerox						X		X							2

Figure 3-2. BLM uses 130 ADP and telecommunications vendors (continued)

Vendor	ARIZONA	BIFC	CALIF.	COLO.	DSC	ESO	IDAHO	MONT.	NEVADA	NEW MEX.	OREGON	UTAH	WYOMING	OCCURENCES
Telecommunications														
Bell													X	1
Cermetek		X												1
Codex	X			X			X	X		X		X	X	7
Concord Data				X										1
Digilog	X													1
Equinox	X													1
Gandalf Data				X			X	X				X		4
Hayes		X			X					X		X		4
Infotron Systems				X								X		2
Jacobson				X								X		2
Microcom		X												1
Multi Tech				X										1
Omnimux					X									1
Paradyne	X						X						X	3
Penril				X								X		2
Racal-Milgo		X								X		X		3
Racal/Vadic		X			X				X					3
Radio Shack				X										1
Ram							X							1
Synergetics Intl.		X												1
TAC				X										1
UDS							X							1
Ventel	X	X		X			X		X	X		X	X	8

Figure 3-3. BLM Has Approved Over $6,500,000 of New Equipment for FY86

ITEM	COST*	QUANTITY
Terminals & Printers - Generic	$ 315	214
Micros - Generic (Philips)	$ 544	95
Micros - Sole Source (S/S)	$ 160	41
Wang WP Existing Conract	$ 527	86
GIS CPUs (FWS/BLM) Procure	$1,199	6
GIS Plotters & Digitizers	$ 715	52
Dgtzrs, Pltrs, Grphcs Trms S/S	$ 226	13
DG Equipment S/S	$ 69	3
Honeywell Upgrd L6 & DPS-870	$ 314	14
Computer Assisted Drafting	$ 298	6
Uninterruptable Power Source	$ 360	1
Computer Microfilm Unit	$ 200	1
Data Communications	$ 194	23
Contract Programming Supt	$ 150	
Contract Digitizing Service	$1,233	1
Misc Datacomm & ADP	$ 74	31
TOTALS	$6,578	

* - All cost amounts are in thousands

The DSC DPS-8 system consists of two Honeywell 8/70 CPUs rated at approximately 1.7 million instructions per second (MIPS) each, two megawords of 36-bit memory, four communications front-end processors, 44 disk drives holding 14,300 megabytes of data, and the usual assortment of tape drives, line printers, card readers, etc. The DPS-8 system was considered a major mainframe in 1978. For comparison, an IBM 3081 Model K (a common mainframe computer) has a MIPS rating of 18.1 and a VAX 11/780 (a common "minicomputer") has a MIPS rating of about 1.0.

As important to the Honeywell network as the mainframe are the distributed processors, the Level 6 systems located in each State Office. The Level 6 product line consists of a family of 16-bit computers capable of simultaneously processing local applications and performing network functions such as remote terminal emulation, file transfer, and remote printing.

The majority of the applications operating on the Honeywell network support BLM's administrative and case recordation requirements. These include:

- All of BLM's Financial Management (FM) systems, such as Accounts Payable, Accounts Recievable, General Ledger, budgeting, etc.
- Case Recordation and ORCA
- Job Documentation Reporting (JDR)
- Range Management Automated System (RMAS)

3.3.2 GIS Systems Category

BLM operates independant computers systems at DSC and several State Offices to support the development and production use of the Geographic Information System (GIS). GIS consists of a wide range of tools and capabilities that support field personnel in developing Resource Management Plans (RMPs), and in geographical resource analysis and mapping applications.

The majority of GIS systems within BLM are run on Data General minicomputers. Six State Offices have Data General GIS computer systems used for production work. DSC has two GIS systems used for software development and production analysis; one is a Data General DG-330, and the other a Hewlett-Packard HP3000. The primary purpose of GIS support on the HP3000 is remote sensing digitizing image analysis.

While all of the GIS computers have the characteristics of mini-computers, they have significant ADP processing capability. The Data General MV8000 at the Colorado State Office is rated as having more raw MIPS than one of the CPUs in the Honeywell DPS-8 system. It is important to realize that ADP power is no longer directly proportionate to physical size or initial purchase price.

3.3.3 Office Automation and Personal Computers Category

BLM has a significant amount of ADP processing capability in the Wang OIS Office Automation systems and in personal computers. All State Offices, most District Offices, some Resource Area Offices, and the Washington Office have Wang OIS systems. In addition, BLM has over 150 Wang Personal Computers (PCs) running the industry standard MS/DOS operating system, and over 250 PCs from other vendors. The aggregate ADP processing power of BLM's more than 400 PCs is significant, and may be greater than that of the Honeywell network.

Although an in-depth analysis of BLM's office automation systems and personal computers is not included in AMS' modernization study, we did include any systems that we encountered during our inventory of the other ADP systems.

3.3.4 Other BLM Operated Computer Systems Category

In order to support the wide variety of applications specific to individual states and functions, BLM operates a number of small to mid-sized computers in individual State and District Offices. These systems include:

- Burroughs systems in Alaska, New Mexico, Montana and Wyoming

- Data General MV10000 in BIFC for fire fighting analysis and in Alaska
- Data General Eclipse M-600 in New Mexico, DSC and Wyoming
- Hewlett-Packard systems in Oregon, Wyoming, DSC and BIFC

Like the GIS systems, some of these systems have significant ADP processing power. The Data General MV10000 is the fastest Data General processor in use at BLM. It is rated at more than 2 MIPS, and thus has more raw MIPS than one of the main CPUs in the Honeywell DPS-8 system.

3.3.5 Systems Operated by Outside Agencies Category

BLM also makes use of computer systems operated by other government agencies and commercial vendors when specialized data, software, or capabilities are required. During Fiscal Year 1985, BLM spent approximately $1.7 million on outside services. Applications supported include:

- Electronic mail by Dialcomm
- Road Design and access to numerous other systems on US Forest Service (USDA) machines
- Pay/Pers on Bureau of Reclamation hardware
- Many timesharing and batch applications used by Oregon on Bonnville Power Administration
- MS-1 on USGS Multics (to be put on microcomputers October 1, 1986)

3.4 Physical Locations of ADP Systems

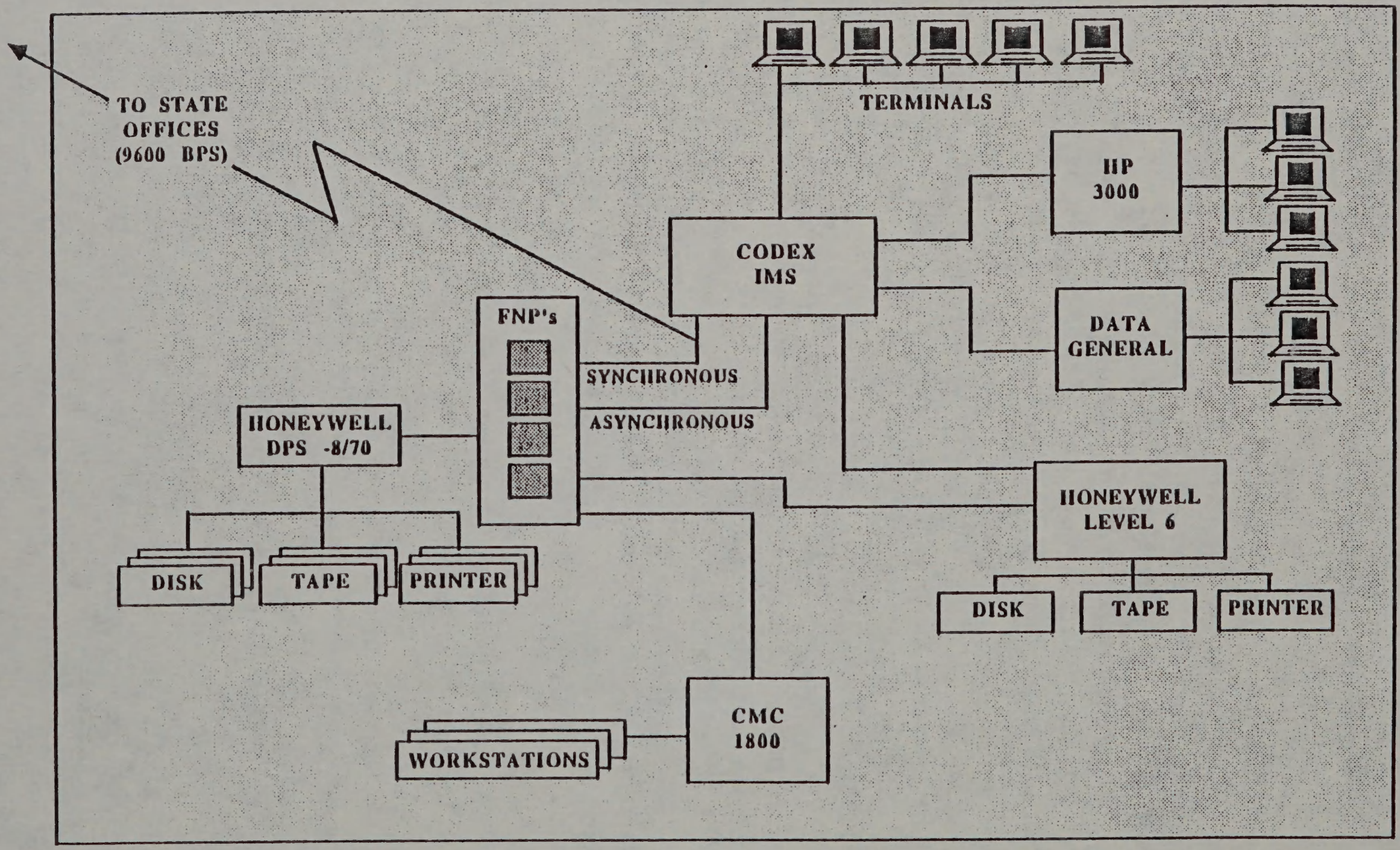
In order to fully understand BLM's ADP capabilities, it is necessary also to study them from the perspective of their physical locations. This perspective is important in order to identify and evaluate alternative architectures which are based on different approaches to the distribution and placement of facilities (computers, software, and network links). For this reason the detailed discussion of each category of BLM automation is presented by location (eg. DSC, State Office). Figure 3-1 gives an overview of the locations with an indication of the major hardware located there.

The individual computers within the Honeywell network are located at the Denver Service Center (DSC), at each State Office, at BIFC, and at the Phoenix Training Center. The GIS computers are located in six State Offices, and DSC. Other systems, especially those based on microcomputers, are located in the field, frequently at District and Resource Area offices and the Washington Office. Most of these computer systems are at least minimally connected via the BLM telecommunications network.

BLM's Denver Service Center (DSC) contains the single largest concentration of ADP resources in the Bureau. In all, DSC operates five computer systems located in three separate computer rooms (as summarized in Figure 3-4):

- **A Honeywell DPS-8/70 mainframe** -- used to support BLM-wide application systems and for general ADP timesharing.
- **A Honeywell Level 6 minicomputer** -- used to develop software for use on the State Offices' Level 6s.
- **A Sperry-Univac CMC 1800** -- to provide data entry services for the DPS-8.
- **A Data General Eclipse C-330 and a Hewlett-Packard HP3000 with an array processor** -- for the development of BLM's Geographical Information System.

Figure 3-4. Overview of Denver Service Center ADP Network



3.5 Honeywell Computer Network by Location

The BLM Honeywell network consists of Honeywell computers, both mainframe and minicomputers located at BLM facilities, portions of the BLM telecommunications network connecting the computers, and appropriate network and operating system software. The largest single system (or node) in the network is a dual processor Honeywell DPS-8 mainframe. Sixteen Honeywell Level 6 mini-computers are the nodes that complete the network. These are located in State Offices (two in the Arizona State Office and three in Montana), DSC, and BIFC.

3.5.1 Honeywell DPS-8 Mainframe

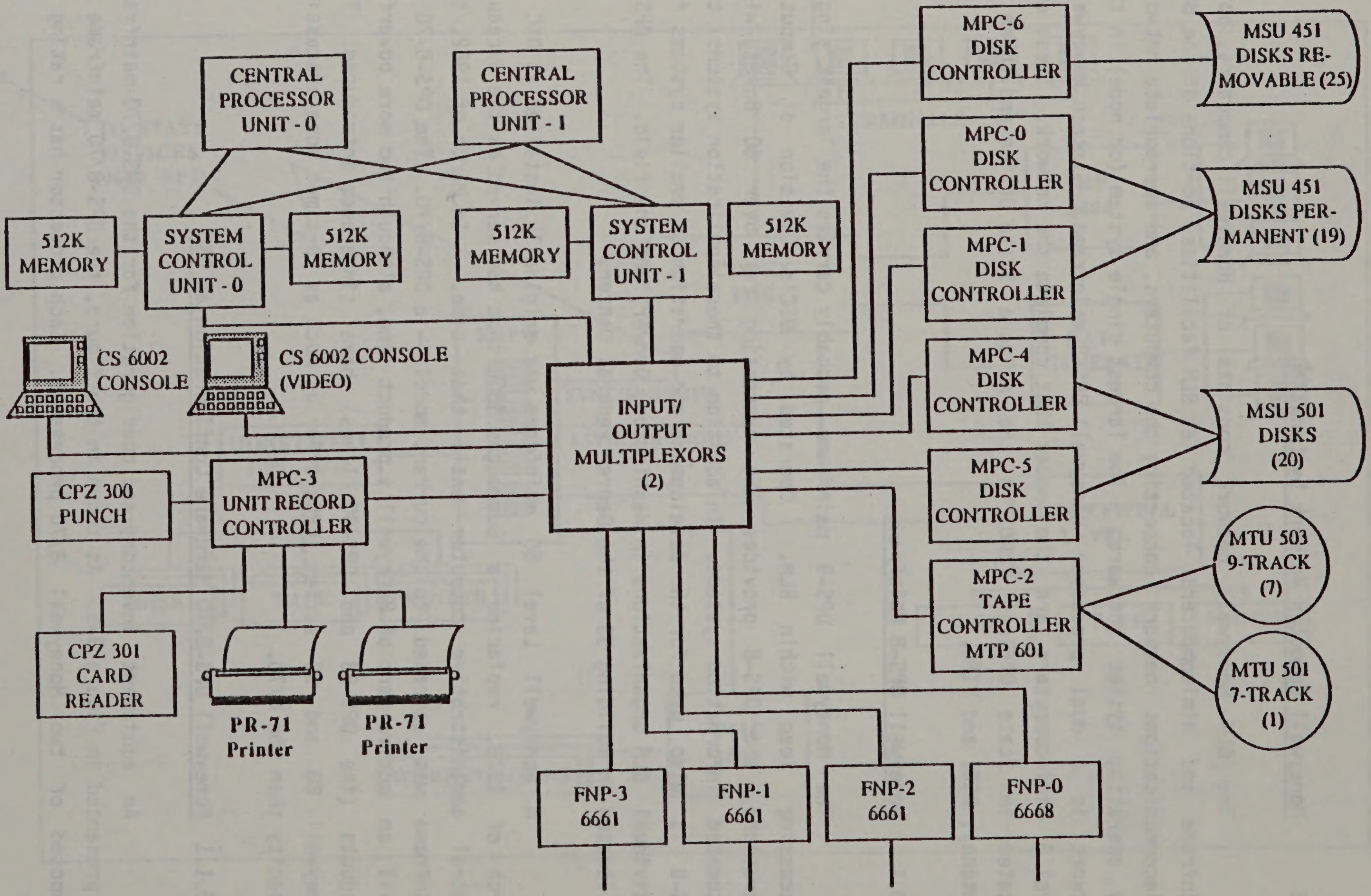
The Honeywell DPS-8 mainframe probably carries the largest single processing load within BLM. Operated by DSC's Division of Computer Operations, the DPS-8 provides the processing for over 60 Bureau-wide automated information systems. In addition to these application systems, the DPS-8 is also used for the development and operation of smaller systems for individual BLM organizations in Washington, Denver, and the field. The DPS-8 is located in Building 53 of the Denver Federal Center.

A Honeywell Level 66 mainframe was originally installed at DSC in March of 1978, replacing a Burroughs 5500 that had served as the Bureau's central administrative computer until that time. In March of 1982, the mainframe was upgraded to the current model -- a DPS-8/70. The DPS-8/70 is still an active part of Honeywell's product line, although two more powerful products (the DPS-88 and DPS-90 lines) have since been introduced. The Honeywell 88 and 90 series CPUs offer as much as 20 times more processing capacity than the 8/70.

3.5.1.1 Honeywell DPS-8/70 Hardware Configuration at DSC

An equipment inventory and configuration for the DPS-8/70 mainframe is presented in Figure 3-5. As shown in the figure, the DPS-8/70 mainframe is composed of two Honeywell 8/70 processors. Each processor has a rating of

Figure 3-5. DPS-8/70 Hardware Configuration



approximately 1.7 MIPS (million instructions per second). The DPS-8/70 has 2 million 36-bit words of internal memory. Two million words of memory is roughly equivalent to 8 to 12 million bytes of memory on a byte oriented machine, such as a VAX or IBM 3081 system.

In addition to the two main processors, there are four Front-end Network Processors (FNP) which offload communications processing from the DPS-8/70 CPUs. The FNPs process all terminal traffic and control communications to the Level 6 systems in the Honeywell network. Three are Honeywell model FNP 6661s and one is a FNP 6678. Each FNP supports up to 96 lines and a variety of protocols (e.g., TTY, synchronous/asynchronous, HDLC, 2780/3270/3280) at rates from 300 baud to 9600 baud. The total data transfer rate between each FNP and the 8/70 processors is 8 million bits per second. Each FNP is controlled by Honeywell's General Remote Terminal Supervisor (GRTS) Version II network software. The majority of terminal traffic handled by the FNP's is directed to them from the DSC data PBX, the Codex Intelligent Matrix Switch (IMS).

Attached to the DPS-8/70 are forty-four Honeywell MSU451 removable disk drives and five Honeywell MSU501 fixed disk drives for data storage. (The MSU451 and MSU501 are actually manufactured by Memorex for sale by Honeywell.) Approximately 20 of the MSU451 drives are logically configured as "permanent" even though the disks are physically removable. The remaining 24 drives are used as mountable devices. The MSU451's can each store 256 megabytes of data; the capacity of each MSU501 is 1,100 megabytes (or 1.1 gigabytes). The total on-line storage for the DPS-8 is therefore almost 17 gigabytes, not counting unmounted packs for the removable disks.

For backup and batch tape processing, the DPS-8/70 uses eight Honeywell MTU503 tape drives. (Like the disk drives, the MTU503's are actually manufactured by another company -- in this case, Storage Technology Corporation -- and sold under the Honeywell name.) The MTU503 is a 9 track drive that can read 800 and 1600 BPI tapes at a rate of 125 inches per second (IPS).

For hardcopy output, the DPS-8/70 uses two Honeywell PR-71 printers. Each PR-71 printer has a print speed of approximately 1000 lines per minute.

Other peripherals on the DPS-8/70 include:

-- card punch unit,
-- card reader, and
-- operator consoles.

There are over 145 terminals distributed throughout the Denver Service Center, many of which have access to the DPS-8/70 through the Codex Intelligent Matrix Switch (usually referred to as the IMS, see section 3.10 for more information). These terminals include the following types:

-- CTS 3810 terminals,
-- Digital Equipment Corporation (DEC) hardcopy terminals (mostly Model LA-120's),
-- Honeywell VIP video-display terminals (7205, 7801, and 7813),
-- Omron 8025 video-display terminals,
-- Tandberg video-display terminals,
-- Superbrain microcomputers,
-- Execuport hardcopy portable terminals,
-- Lear Siegler ADM-3 video-display terminals,
-- Osborne personal computers, and
-- Philips microcomputers.

Since these terminals are for the most part linked to the IMS they are not exclusively tied to the DPS-8/70.

In traditional computer systems, terminals are considered peripherals similar to card readers or line printers. The introduction of dial-up terminals, and subsequent data PBXs, added complications. Is a terminal a peripheral to the DPS-8 if it is not currently connected? Is it still a DPS-8 peripheral when it is connected to a GIS machine? Is it a DPS-8 peripheral when it is connected to a Level 6 and using remote terminal concentration software to access the DPS-8? It is clear that modern telecommunications networks have complicated the picture of terminals as peripherals to any specific computer.

3.5.1.2 Honeywell DPS-8/70 System Software

The DSC DPS-8/70 system installed Honeywell's GCOS III operating system in November 1982. GCOS III was designed to provide flexibility. It supports production batch processing, interactive timesharing, and high-volume transaction processing simultaneously. GCOS III provides the systems manager with tools to tune the performance characteristics of the system to match the workload profile of the user community. The flexibility of GCOS III is contrasted by other operating systems which are focused to optimize a single aspect of ADP processing, such as IBM's MVS which is biased towards batch processing, and UNIX which is biased towards interactive timesharing.

Honeywell has stabilized the functionality of GCOS III, and is only providing maintenance releases to fix bugs. All of Honeywell's development efforts are concentrated in a greatly upgraded version of the GCOS operating system, GCOS 8. By taking advantage of the increased power of GCOS 8, (i.e., virtual memory, non-contiguous disk files, advanced network capabilities) Honeywell has developed software tools and utilities BLM might find useful, such as relational database systems, electronic mail systems, industry standard networking products (i.e. X.25, ISO OSI, X.400), "fourth generation" application development languages (4GL), and user-friendly applications such as ad-hoc query languages and spreadsheets. Since these packages utilize the new features of GCOS 8, they cannot run in the current BLM DPS-8 GCOS III environment.

Honeywell claims that GCOS 8 is totally upward compatible with GCOS III for all applications written in high level languages such as COBOL or FORTRAN, but not for applications written in their GMAP assembly language. Honeywell provides a number of tools and services to help smooth the transition. One very interesting tool is the ability to split a dual processor system, such as BLM's, into two systems, one running GCOS III with the other running GCOS 8, with limited simultaneous file access sharing between the two operating systems. This greatly simplifies testing.

The existing DSC hardware could be used to support GCOS 8. Honeywell designed GCOS 8 to run on the 8/70 CPUs as well as the newer, more powerful 88 and 90 series systems. However, like all software that gains significant additional functionality, GCOS 8 has also gained size and some inefficiency. As a result, it is more suited for the larger, faster systems. To insure that the existing workload supported under GCOS III on the 8/70 hardware configuration of BLM would remain adequately supported under GCOS 8, a comprehensive, detailed study of the DPS-8 system usage is required.

3.5.1.3 Honeywell DPS-8/70 Languages and Utilities.

The DPS-8/70 has a total of five compilers: FORTRAN IV, FORTRAN 77, COBOL-68, COBOL-74, and PASCAL. In addition to these compiled languages, APL and Basic interpreters are available. The DPS-8/70 also has a variety of utilities for data entry and program creation. A complete list of the DPS-8/70 system software, utilities, and applications packages is presented in Figure 3-6.

One of the most frequently used pieces of system software running on BLM's DPS-8/70 is the ASPEN/2 data base management system. ASPEN/2 is widely used by DSC systems personnel and by non-ADP specialists in the field to develop software for a wide range of systems used in administration, technical services, energy and minerals, lands, and renewable resources. Also, the DPS-8/70 utilizes DMIV-TP (DBMS) on-line processing.

Figure 3-6. Honeywell DPS-8/70 System Software.

Description	Type
APL-66	Interpreter
ASPEN	DBMS
BMD	Utility
CFMS	Utility
COBOL-68 Compiler Runtime and ISF Facility	Compiler
COBOL-74 Compiler and Runtime Facility	Compiler
COBOL-74 Subschema Translator	Utility
Debug Support System	Utility
DM-IV Schema/Subschema Translator	Utility
DM-IV Transaction Processing	Utility
File Generation Facility	Utility
FORTRAN Compiler and Runtime Facility	Compiler
GCOS III Operating System Executive	Operating System
GCOS DM-IV Comprehensive Package	Utility
GCOS-SR 4JS3 P* Microfiche Package	Utility
GRTS-II HDLC Support Option	Network Software
GRTS-II Interactive Bisynchronous System	Network Software
I-D-S/I Facility	Utility
I-D-S/II Language Facility	Utility
Interactive On-line Report Processor (PMCS/66)	Utility
Level-6 Host File Transceiver Facility	Utility
Mixed Integer Prog.	Utility
MPS/66 Generalized Upper Bound	Utility
MPS Basic System	Utility
Network Processor, PMCS/66	Utility
PASCAL	Compiler
Resource Scheduler, PMCS/66	Utility
SARA-H	Utility
SIMSCRIPT	Utility
Timesharing Facility	Utility
TSS BASIC Language Option	Interpreter
TSS Library	Utility
TSS Text Processing Library (TEXLIB)	Utility
TSS Text Processing Option (TEX)	Utility
Utility/Maintenance Facility	Utility

3.5.1.4 Applications Supported by the Honeywell DPS-8/70

The DPS-8/70 configuration is used for development and operation of two types of applications: BLM-wide applications systems and general timesharing for BLM personnel.

- **BLM-wide Applications.** The DPS-8/70 is used for operations and maintenance functions for approximately 60 designated Bureau-wide application systems. These systems are usually large applications used by BLM offices across the country such as the Financial Management System, the Range Management Automated System, the Mining Claims Recordation System, and the Case Recordation System. Figure 3-7 lists these applications. Appendix B contains a functional summary of each application.

- **General Timesharing.** In addition to supporting the BLM-wide application systems, timesharing capabilities are provided through GCOS's TSS timesharing system. The DPS-8/70 is used by BLM personnel at DSC and in the field as a general timesharing resource for developing and operating specialized tracking, program management, and technical analysis systems.

  Many other systems have been developed, maintained, and operated by BLM program personnel (not ADP specialists) and are written in BASIC, FORTRAN, and COBOL or ASPEN/2 data manager capabilities. While DSC does not provide any formal support for such applications, managers in the Division of Computer Operations estimate that as much as 50% of the TSS resources are devoted to such general timesharing users.

Figure 3-8 summarizes the characteristics of the Bureau-wide applications. Most are written in COBOL. Few, if any, are interactive or make use of database technology. However, the DMIV-TP data base systems consume a significant amount of DPS-8/70 on-line and batch resources. No fourth generation languages are available.

Figure 3-7. BLM-wide Application Systems.

System Name	System Code
Adopt-a-Horse Data System	HB
Aging of Accounts Receivable	FA
Automated Coal Lease Data System	ACLDS
Automated Federal and Indian Leaseable Minerals System	AFILMS
Automated Management by Objectives System	MBO
Aviation Contract Monitoring	AC
BLM Planning Schedule System	SS
Budget Matrix	BM
Cadastral Survey Field Note System	CS
Chargeback	CB
Checks to Treasury	FC
Corridor Environmental Impact Statement Program	EI
Data Element Dictionary	DD
Deposits-in-Transit	FD
Digital Elevation Model System	DEM
Eastern States Minerals	ESM
Eastern States Office Patent Index	ESOPI
Ecological Site Inventory	ES
Emergency Fire Fighters	EB
Financial Management Edits	FE
Financial Management Reports	FR
Financial Management Year-End Processing System	FY
Fire Cost Reports	FF
Forest Models	PM
Forest Utility Programs	PU
General Ledger System	FG
General Entry Transaction Processor System	GETP
Health Risk Appraisal Program	HR
Imprest Fund	FI
Job Documentation Reporting	JD
Lands and Minerals Case Recordation System	LMCRS
Lease Management	LM
Material Sales	MS
Minerals System 1	MS-1
Mining Claim Recordation	LT
Motor Vehicle System	MV
Operating Budget	OB

Figure 3-7. BLM-wide Application Systems. (cont'd)

System Name	System Code
Payroll Costs	FB
Payroll/Personnel	FB/MP
Perpetual Inventory	FP
Procurement Planning and Tracking System	PR
Program Management	PG
Property Management System	PS
Public Domain Forest Inventory System	PD
Range Management Automated System	RM
Reimbursable Billing	FJ
SageRam -- Rangeland Investment Analysis Model	SR
Simultaneous Oil and Gas	SIMO
Solid Leasable Minerals System	SLMS
Special Projects	FO
Summer Hire System	SH
Suspense, Budgetary Clearing and Unearned Accounts	FS
Travel Advance System	FT
USFS Forest Inventory System	PF
Water Data Management System	WI
Waterpower System	WP
Wildlife Information System	WL
Wildfire Reporting System	FDR-AFFIRMS

Note: ACLDS and AFILMS have recently been replaced by the Solid Leasable Minerals System (SLMS).

Figure 3-8. Characteristics of Bureau-wide Applications

Application	Language	Lines of Code	Software Tools Used	DBMS	Processors Used	Comments
1. Adopt-A-Horse (to be replaced in 1986)	COBOL	10,000	ASPEN	NO	DPS-8/Level 6	
2. Aging of Accounts Receivable	COBOL	*	NONE	NO	DPS-8	Financial Management Subsystem
3. Automated Coal Lease Data System	-	-	-	-		Inactive - now SLIMS
4. Automated Federal and Indian Leasable Minerals System	-	-	-	-		Inactive - now SLIMS
5. Automated Management by Objectives System (MBO)	COBOL	N/A	TP/DM4	YES	DPS-8	
6. Budget Matrix	FORTRAN	N/A	NONE	NO	DPS-8	Spreadsheet
7. Cadastral Survey Field Note System	COBOL	14,000	ASPEN	NO	DPS-8	
8. Chargeback (CB)	COBOL	30 programs	NONE	YES	DPS-8	
9. Checks to Treasury	COBOL	*	NONE	NO	DPS-8	Financial Management Subsystem
10. Corridor Environmental Impact Statement Program	FORTRAN	N/A	NONE	NO	DPS-8	Inactive
11. Data Element Dictionary (DD)	COBOL	24 programs	-	YES	DPS-8	Development Tool
12. Deposits-in-Transit	COBOL	*	NONE	NO	DPS-8	Financial Management Subsystem
13. Digital Elevation Model System	COBOL	N/A	NONE	NO	DPS-8	Inactive

* = Part of Financial Management System
- = Not pertinent
N/A = Not Available

Figure 3-8. Characteristics of Bureau-wide Applications (continued)

Application	Language	Lines of Code	Software Tools Used	DBMS	Processors Used	Comments
14. Eastern States Minerals	COBOL	2 programs	NONE	NO	DPS-8	
15. Eastern States Office Patent Index	-	-	-	-	-	Inactive
16. Ecological Site Inventory	COBOL/ FORTRAN	N/A	NONE	NO	DPS-8	
17. Emergency Fire Fighters	COBOL	N/A	NONE	NO	DPS-8	
18. Financial Management Edits (FME)	TP/DMX	*	NONE	YES	DPS-8	Financial Management Subsystem
19. Financial Management Reports	COBOL	*	NONE	NO	DPS-8	Financial Management Subsystem
20. Financial Management Year-End Processing System	COBOL	*	NONE	NO	DPS-8	Financial Management Subsystem
21. Fire Cost Reports (FCR)	COBOL	*	NONE	NO	DPS-8	Financial Management Subsystem
22. Forest Models	FORTRAN	N/A	NONE	NO	DPS-8	Timeshared model
23. Forest Utility Programs	FORTRAN/ BASIC	N/A	SPSS/ SAS	NO	DPS-8	Timeshared model
24. General Ledger System	COBOL	*	NONE	NO	DPS-8	Financial Management Subsystem
25. General Entry Transaction Processor System	-	-	-	-	DPS-8	Development tool
26. Health Risk Appraisal Program	FORTRAN	N/A	NONE	NO	DPS-8	
27. Imprest Fund	COBOL	*	NONE	NO	DPS-8	Financial Management Subsystem

* = Part of Financial Management System
- = Not pertinent
N/A = Not Available

Figure 3-8. Characteristics of Bureau-wide Applications (continued)

Application	Language	Lines of Code	Software Tools Used	DBMS	Processors Used	Comments
28. Job Documentation Reporting	COBOL	N/A	ASPEN	NO	DPS-8	
29. Lands and Minerals Case Recordation System	COBOL	74 programs	ASPEN	YES	DPS-8	
30. Lease Management	COBOL	1 program	NONE	NO	DPS-8	Incorporated into Case Recordation in 1986
31. Material Sales	COBOL	12,000	ASPEN	NO	DPS-8	Will use TP/DM4, DBMS and BASIC in 1986
32. Minerals System 1	ASPEN	N/A	ASPEN	NO	MULTICS	
33. Mining Claim and Recordation	TP/DM4	80,000	ASPEN	YES	DPS-9	
34. Motor Vehicle System	COBOL	N/A	NONE	NO	DPS-8	Will use TP/DM4 and DBMS in 1984
35. Operating Budget	COBOL	N/A	NONE	NO	DPS-8/Level 6	
36. Payroll Costs	COBOL	*	NONE	NO	DPS-8	
37. Payroll/Personnel	COBOL	N/A	NONE	NO	DPS-8	Front end to PAY/PERS
38. Perpetual Inventory	COBOL	*	NONE	NO	DPS-8	Financial Management Subsystem
39. Procurement Planning and Tracking System	COBOL	N/A	NONE	NO	DPS-8	considering micro version
40. Program Management	COBOL	N/A	NONE	NO	DPS-8	
41. Public Domain Forest Inventory System	FORTRAN COBOL	N/A	NONE	NO	DPS-8	Timeshared application

* = Part of Financial Management System
- = Not pertinent
N/A = Not Available

Figure 3-8. Characteristics of Bureau-wide Applications (continued)

Application	Language	Lines of Code	Software Tools Used	DBMS	Processors Used	Comments
42. Range Management Automated System	FORTRAN COBOL	N/A	ASPEN	NO	DPS-8/Level 6	
43. Reimbursable Billing	COBOL	*	NONE	NO	DPS-8	Financial Management Subsystem
44. SageRam -- Rangeland Investment Analysis Model	FORTRAN	N/A	NONE	NO	DPS-8	Timeshared model
45. Simultaneous Oil and Gas	COBOL	N/A	NONE	NO	DPS-8	
46. Financial Management Subsystem	COBOL	N/A	NONE	NO	DPS-8	
47. Summer Hire System	COBOL	N/A	NONE	NO	DPS-8	
48. Suspense, Budgetary Clearing and Unearned Accounts	COBOL	*	NONE	NO	DPS-8	Financial Management Subsystem
49. Travel Advance System	COBOL	*	NONE	NO	DPS-8	Financial Management Subsystem
50. USFS Forest Inventory System	FORTRAN	N/A	NONE	NO	DPS-8	Timeshared model
51. Wildlife Information System	COBOL	N/A	ASPEN/ IQ	NO	DPS-8	
52. Wildfire Reporting System	COBOL	7 programs	ASPEN	NO	DPS-8	
53. Aviation Contract Monitoring	COBOL	3 programs			DPS-8	
54. Water Data Management System	COBOL	8 programs	ASPEN	NO	DPS-8	
55. Waterpower System	COBOL	25 programs	ASPEN	NO	DPS-8	
56. BLM Planning Schedule System	COBOL	8 programs	TP/DM4	YES	DPS-8	
57. Property Management System	COBOL	40 programs	TP/DM4	YES	DPS-8	
* = Financial Management System		200,000- 300,000				

- = Not pertinent

N[illegible] Not Available

3.5.2 Honeywell Network: DSC Level 6

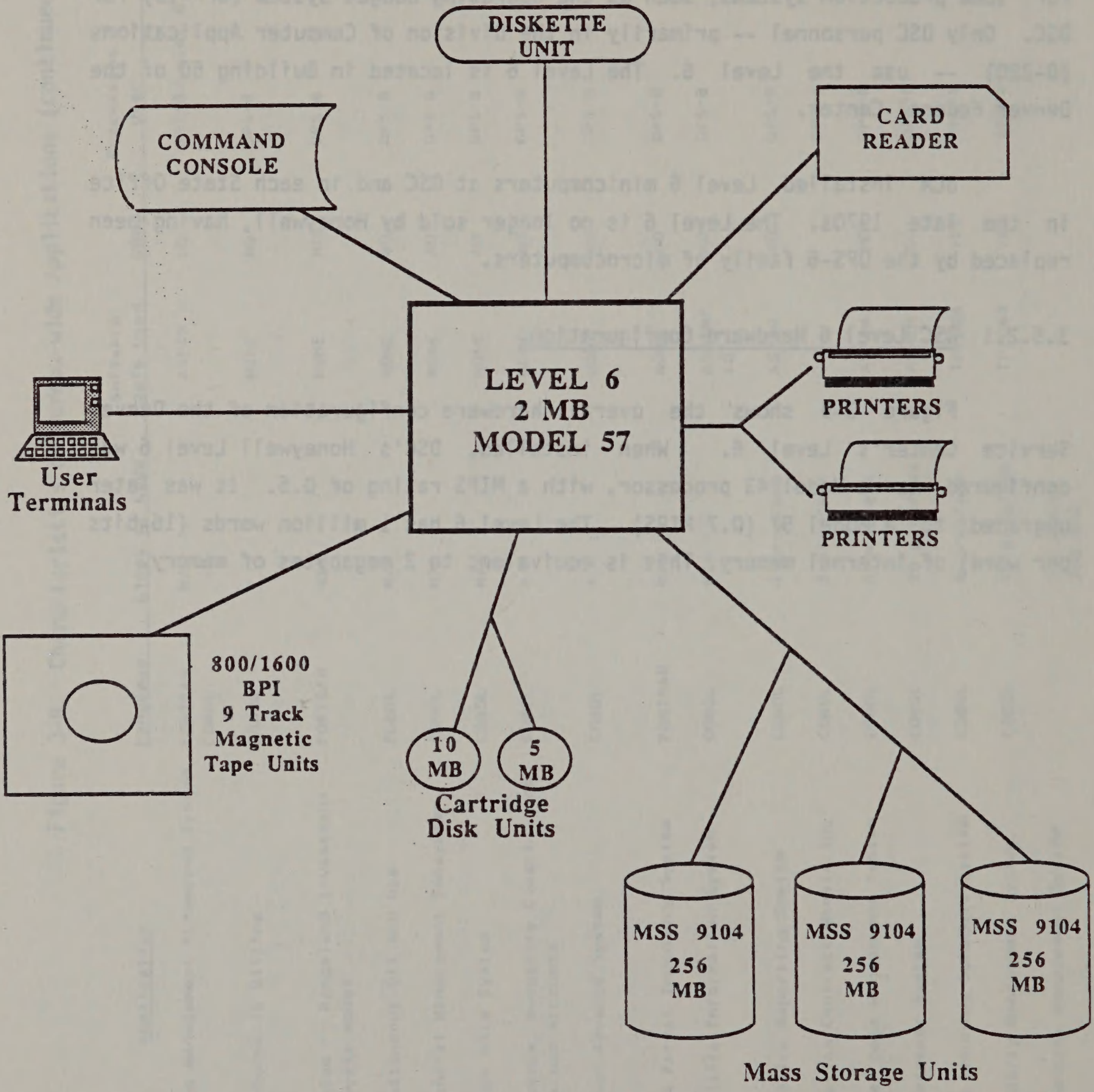
The Denver Service Center operates a Honeywell Level 6 minicomputer used to develop and test software to be distributed and operated on the Level 6 minicomputers in each of BLM's State Offices. The DSC Level 6 is not used for some production systems, such as the Operating Budget System (DPP-10) for DSC. Only DSC personnel -- primarily in the Division of Computer Applications (D-220) -- use the Level 6. The Level 6 is located in Building 50 of the Denver Federal Center.

BLM installed Level 6 minicomputers at DSC and in each State Office in the late 1970s. The Level 6 is no longer sold by Honeywell, having been replaced by the DPS-6 family of microcomputers.

3.5.2.1 DSC Level 6 Hardware Configuration.

Figure 3-9 shows the overall hardware configuration of the Denver Service Center's Level 6. When installed, DSC's Honeywell Level 6 was configured as a Model 43 processor, with a MIPS rating of 0.5. It was later upgraded to a Model 57 (0.7 MIPS). The Level 6 has 1 million words (16-bits per word) of internal memory. This is equivalent to 2 megabytes of memory.

Figure 3-9. Level 6 Hardware Configuration at DSC



DSC's Level 6 has three Honeywell MSS 9104 disk drives. Each MSS 9104 stores 256 megabytes of data on removable disk packs. In addition, the Level 6 uses a 10 megabyte cartridge disk system for data storage. For backup and batch tape processing, there are two Honeywell tape drives. The remaining peripherals on the Level 6 include system printers and a card reader.

The Honeywell Level 6 is connected to the DPS-8 through the Front-end Network Processors by a short 9600 baud communications link. The Level 6 uses Honeywell RNP (Remote Network Processor) software to communicate with Honeywell GRTS/II software in the DPS-8 FNPs. This software package supports terminal concentration, file transfer, and batch remote job entry input and output.

There are a wide variety of terminals distributed around the Denver Service Center which have access to the Level 6. These terminals include the same types as those used to access the DPS-8 (as described above).

3.5.2.2 DSC Level 6 System Software.

The DSC Level 6 operating system is GCOS-6 (Mod. 400, Release 3.1), installed in April 1985. The Level 6 has compilers for FORTRAN, BASIC, and COBOL, in addition to the GMAC assembler. DSC's Level 6 runs the standard mix of system software used by each of BLM's State Offices, as well as a number of special packages that facilitate software development. A complete list of the system software for the Level 6 is presented in Figure 3-10.

3.5.2.3 DSC Level 6 Applications.

The DSC Level 6 is a development system, it is not used for production processing. Rather than running applications as the other Level 6s in the Honeywell network, the DSC Level 6 is used for maintenance, enhancement, and testing. DSC has developed a number of systems on the Level 6, including the Case Recordation System and the Automated Personal Property System. When a Level 6 application system has been fully developed, it is distributed to BLM's twelve State Offices to be loaded and used on a continuing basis.

Figure 3-10. Honeywell Level 6 System Software.

Description	Type
2780/3780 WKSTN Facility	Utility
Advanced Assembler	Assembler
Advanced COBOL	Compiler
Advanced FORTRAN	Compiler
BASIC Interpreter/Compiler	Compiler
BSC Transport Facility	Utility
Data Entry Facility (DEF-II)	Utility
DM6 I-D-S/II (Including RUN-TIME Service)	Utility
DM6 Transaction Processor (DM6 TP)	Utility
GCOS-6, Mod. 400, Release 3.0	Operating System
Honeywell Communications & File Transfer Facility -- Release 3.5	Network Software
INFO-6	Utility
OAS Document Processing	Utility
OAS Records Processing	Utility
Production Facility (UPF)	Utility
RNP-6 with LHDLC, RFF, RBFII, RCF, & ATI	Utility
SORT/MERGE	Utility
TPS6 Screenwrite	Utility
TPS6 Transaction Processing System	Utility

3.5.2.4 DSC Level 6 Support Staff.

The DSC Level 6 is not used for significant production work. As a result, its support requirements are more modest than other BLM systems. It is operated by the Division of Computer Operations (D-250) with software development performed by the various teams in the Division of Computer Applications (D-220). No user representatives are required since it is for DSC use only.

3.5.3 Honeywell Network: State Office Level 6s

The Honeywell Level 6 is the only CPU which exists in every State Office. Appendix A provides detailed configuration information for each state. The following provides a summary of Appendix A's information.

3.5.3.1 State Office Level 6 Hardware Configuration.

There are 14 Level 6 systems installed in BLM's 12 State Offices, BIFC, and the Phoenix Training Center. There are four models in use: models 33, 43, 47 and 57. The model 47, found in four of BLM's 12 State Offices. The model 47 has a processing speed of approximately .3 MIPS. Internal memory sizes for the State Office Level 6s range from 256K to 640K bytes. The model 57, used by ten states, BIFC and DSC, is the most powerful Level 6 made by Honeywell; however the distinction between models is not necessarily an indication of increased processing power. For example, the upgrade from a model 43 to a model 47 involves installation of a circuit board to allow COBOL compiling and extended FORTRAN compiling not available on the model 43 but no additional CPU power. Honeywell discontinued the Level 6 as a product in 1983.

All of State Office Level 6 systems use the GCOS 6 Mod 400 operating system. Other systems software is installed only at some States, such as the BASIC Interpreter. Therefore, the tools available to the computer programmer may be quite different from State to State.

The States use five different disk drive models, to support the Honeywell Level 6s. About half of the drives are Honeywell MSS 9104s or MSU 9104s. Each 9104 provides 256Mb of data storage capacity. Each location listed at least one MSS 9104 or MSU 9104. The other drives supporting the Level 6s are Honeywell CDS 9116, cartridge tape drives or CDU 9116s which use smaller 10Mb cartridges for data storage. As with the 9104s, the CDS 9116 has a controller and the CDU 9116 does not. Ten of the 12 State Offices listed a CDU or CDS 9116.

Both seven-track and nine-track Honeywell tape drives are used for the Honeywell Level 6s in the State Offices and BIFC. Thirty of the 37 are definitely nine-track. Every location has at least one Honeywell nine-track, dual-density (800/1600 BPI) tape drive and most locations have two. The Arizona State Office lists four Honeywell tape drives, including one seven-track drive.

3.5.3.2 State Office Level 6 System and Networking software

The field office Level 6 systems use Honeywell's GCOS-6 operating system, MOD 400, Release 3.0 (which was superceded in September 1984) or 3.1.2. Most have at least one language compiler, typically COBOL. Many sites have a number of other utility packages, such as the DEF-2 screen formating/data entry package. All states have just recieved the DSC-developed CPE package, which allows for automated computer performance evaluation.

All sites use Honeywell's RNP (Remote Network Processor) software for communication to DSC. RNP provides remote terminal access, file transfer and batch job submission and output. For more information on RNP, see Section 3.10.

3.5.4 Honeywell network: DSC's Sperry-Univac CMC 1800

While the Sperry-Univax CMC 1800 is not literally a part of the Honeywell computer network, because it does not use the GRTS/II software, it is used exclusively to provide input to two systems: the Honeywell network and Pay/Pers, which is operated at the Bureau of Reclamation.

The Sperry-Univac CMC 1800 is operated by the Division of Computer Operations. The CMC 1800 is used to support DSC data entry operations for activities such as payroll, biological resource inventory, and road design. Accordingly, the CMC 1800 operates in support of the DPS-8/70.

3.5.4.1 Sperry-Univac CMC 1800 Hardware Configuration.

The Sperry-Univac CMC 1800 is a data entry (key-to-disk) minicomputer. There are twenty-five Sperry CMC 108 data entry stations linked to the CMC 1800. It is outfitted with two Sperry CMC 1225 disk drives, one Sperry TP13160 tape drive, and a Sperry 237530-001 printer.

The CMC 1800 is connected directly to the DPS-8, allowing it to function as a remote job entry station for the Honeywell mainframe. The CMC 1800 is similarly tied to the Bureau of Reclamation CDC Cyber mainframe (located in the Denver Federal Center, Building 67, Engineering and Research Center of the Bureau of Reclamation) used to process BLM's payroll.

3.5.4.2 Sperry-Univac CMC 1800 Applications.

The majority of the BLM-wide application systems are supported by data entry forms submitted by field offices, key-entered by the DSC data entry staff using the CMC 1800, and loaded onto the DPS-8 for data validation and processing. The CMC 1800 supports data entry operations for application systems in practically every BLM program -- accounting and financial management, project tracking (JDR), resource inventory and analysis, and engineering. One of the largest users of the CMC 1800 is Payroll, which involves 10,000 time and attendance cards (some of which contain dozens of input lines) keyed every two weeks.

3.5.4.3 Sperry-Univac CMC 1800 Support Staff.

DSC's Division of Computer Operations is responsible for running the CMC 1800. The Division of Computer Operations includes a full time data entry staff who use the system on a daily basis. The CMC is typically in use on a two shift basis, except at the end of each fiscal year, when three shifts may be required.

3.5.5 Honeywell Network: Support Overview

Support for all Bureau-wide applications on the Honeywell computer network is handled by DSC. State specific applications support is divided according to the nature of the application, some are supported by DSC, and other by State Office IRM staff.

DSC support for the Honeywell computer network is similar to the structure of many commercial and government facilities. A three-tier organization is designed to provide responsive service while optimizing the utilization of scarce resources such as highly trained systems programmers.

The first tier provides direct support for end-users by providing "user representatives" for each application. Many of the functions of this tier are also performed by the State Office ADP staff as well as DSC. These user representatives provide technical help to non-ADP field staff for the Bureau-wide applications. User representatives at DSC also develop and implement programs and supervise contracts for ADP program development. Each system has a designated user representative who is responsible for providing programmatic input and assistance to the Division of Computer Applications and for answering questions from system users in the field. The user representatives are responsible for the translation of end-user requests from the subject specific terminology of, for example, a range conservationist, into the computer requirements understandable by the professional ADP staff in the second tier. In addition, the user representatives can quickly solve many common problems by asking questions to lead the user to problem resolution.

The second tier contains professional computer programmers and analysts who design and implement the ADP systems that meet BLM's functional requirements. The application development teams are directly responsible for building new application systems, and maintaining existing systems. In addition, they must modify existing applications in response to Congressional and organizational directives.

The third tier consists of the systems programming and operational support staff that actually run the computer systems and support the operating system and network software.

Within BLM these tiers are supported by several divisions in DSC.

The first tier is the Division of Advanced Data Technology (D-440), Division of Resource Systems (D-470), Division of Financial Operations (D510) and the Division of Records Systems (D-240). These divisions support applications and have user representatives for those applications.

The second tier is Division of Computer Applications (D-220). It is responsible for maintaining and enhancing existing DPS-8 applications software and for developing new BLM-wide systems (e.g., Bond System, Master Name System) that use the mainframe. The Division of Computer Applications is organized into teams, each with responsibility for systems supporting a specific programmatic area (e.g., Financial Management Team, Energy and Minerals Team). One system -- the Automated Land and Minerals Record System (ALMRS) -- is being developed outside of D-220 due to its size and scope; D-220 is providing support to the ALMRS Project Office (D-150).

The third tier is the Division of Computer Operations (D-250). It is responsible for system operations (e.g., system programming, tape mounts, disk backups, performance management, master operators, data entry, communications network control, trouble-shooting). The DPS-8/70 runs 24 hours each day, seven days each week; the system is attended 16 hours each day and runs unattended on weekends and third shift (0:00 - 8:00) except during special periods (e.g., end of fiscal year).

3.6 The Geographic Information System Category

BLM is one of many government land-management agencies using computer technology to simplify the analysis of the interactions between land resources. Geographic Information Systems (GIS) is a general term for a set of software tools that assist this process. GIS allows computer generated graphics to display overlaying resources.

The GIS software used in BLM is public domain; it is not proprietary to any comercial vendor or government agency, since it was developed with government funds and is available without charge. GIS is primarily written in FORTRAN and is implemented on DEC PDP-11s, Hewlett-Packard HP3000s, Prime 2250s, Data General, and other mini-computers in use at BLM, Fish and Wildlife, Bureau of Indian Affiars, US Geological Survery, National Park Service, and US Forest Service.

Six State Offices have Data General (DG) mini-computers used for GIS. There are two GIS machines at DSC: a DG C-330 used primarily for GIS development, and a Hewlett-Packard HP3000. States that do not have their own GIS hardware can use the BLM telecommunications network to access another state's computer, but this does not commonly occur.

The GIS family includes five key subsystems:

- **ADS: Automated Digitizing System.** An interactive data entry system used to capture thematic and graphical data.
- **AMS: Automated Mapping System.** An interactive data entry system used to capture spatial data from maps and aerial photography.
- **MOSS: Map Overlay Statistical System.** An interactive geoanalysis system designed for the analysis of natural resource information.
- **COS: Cartographic Output System.** A software system designed to produce professional quality maps and plots from GIS data.
- **IDIMS: Interactive Digital Image Manipulation System.** A proprietary digital image processing system run on the HP3000.

Unlike the Honeywell computer network systems, and many other BLM computers, the BLM GIS systems are not normally used for general ADP processing. Although the systems are full function computers, they are rarely used for conventional ADP applications, such as would be programmed using COBOL and database management systems (DBMS). Instead, the GIS machines are typically dedicated to GIS processing.

3.6.1 DSC GIS systems: Data General Eclipse C-330 and Hewlett-Packard HP3000

The DSC Data General and Hewlett-Packard GIS systems are addressed together in this section because they serve a common function: they are the GIS support systems within BLM. The Data General Eclipse and Hewlett-Packard HP3000 are operated by DSC's Division of Advanced Data Technology (D-440). They support development work for BLM's Geographic Information System applications, with the HP used primarily in remote sensing digitized image analysis. The Data General and Hewlett-Packard are not directly interconnected, nor are they directly linked to either of the DSC Honeywell computers, they are, however, connected to BLM's telecommunications network through the IMS data PBX. Both minicomputers are located in Building 50 of the Denver Federal Center.

3.6.1.1 DSC GIS Data General Hardware Configuration.

The Data General Eclipse C-330 is a minicomputer in the Data General family of processors. It has a MIPS rating of .2, and is configured with 512 kilobytes of internal memory.

There are three Data General 6061 disk drives and one Data General 6061-A disk drive attached to the Eclipse for data storage. Each of these four disk drives has a storage capacity of 192 megabytes. Batch tape processing and backup are handled by two Data General C/330 tape drives which are DG 6026-S (800/1600 BPI). The remaining peripherals attached to the Data General include a low speed 300 LPM line printer, hard copy terminal, drum plotter, and operator consoles.

The hardware configurations for the Eclipse C-330 is depicted in Figure 3-11.

The Eclipse C-330 runs Data General's AOS operating system. Other system software on the C-330 includes COBOL, BASIC, FORTRAN V and FORTRAN 77.

3.6.1.2 DSC GIS Hewlett-Packard Hardware Configuration.

The Hewlett-Packard HP3000 Series III minicomputer is linked with a ESL, Inc. P821-D Scientific Array Processor to perform high speed mathematical computations as part of the Geographical Information System. It is used primarily for remote sensing digitized image analysis using LANDSAT imagery supplied by NOAA, USGS and NASA.

For disk storage, the HP3000 is attached to six Hewlett-Packard 7025A disk drives, each capable of storing 120 megabytes, and one 7905A disk drive with a capacity of 15 megabytes. Also part of the HP3000 configuration are an HP7970B tape drive, a 2613A line printer (300 lines per minute), and a 7585A drafting plotter.

The hardware configuration for the Hewlett-Packard 3000 is depicted in Figure 3-12.

The Hewlett-Packard 3000 operates under the MPE-IV operating system. Two propriatary software packages are combined to allow use of the Scientific Array Processor, one provided by ESL, Inc., and the other provided by Hewlett-Packard.

3.6.1.3 DSC GIS Applications.

The Division of Advanced Data Technology uses the Eclipse C-330 and the Hewlett-Packard 3000 to support the Bureau's Geographic Information System (GIS). Almost all GIS operations occur in BLM's State and District Offices using software written at DSC.

Figure 3-11. Data General Configuration.

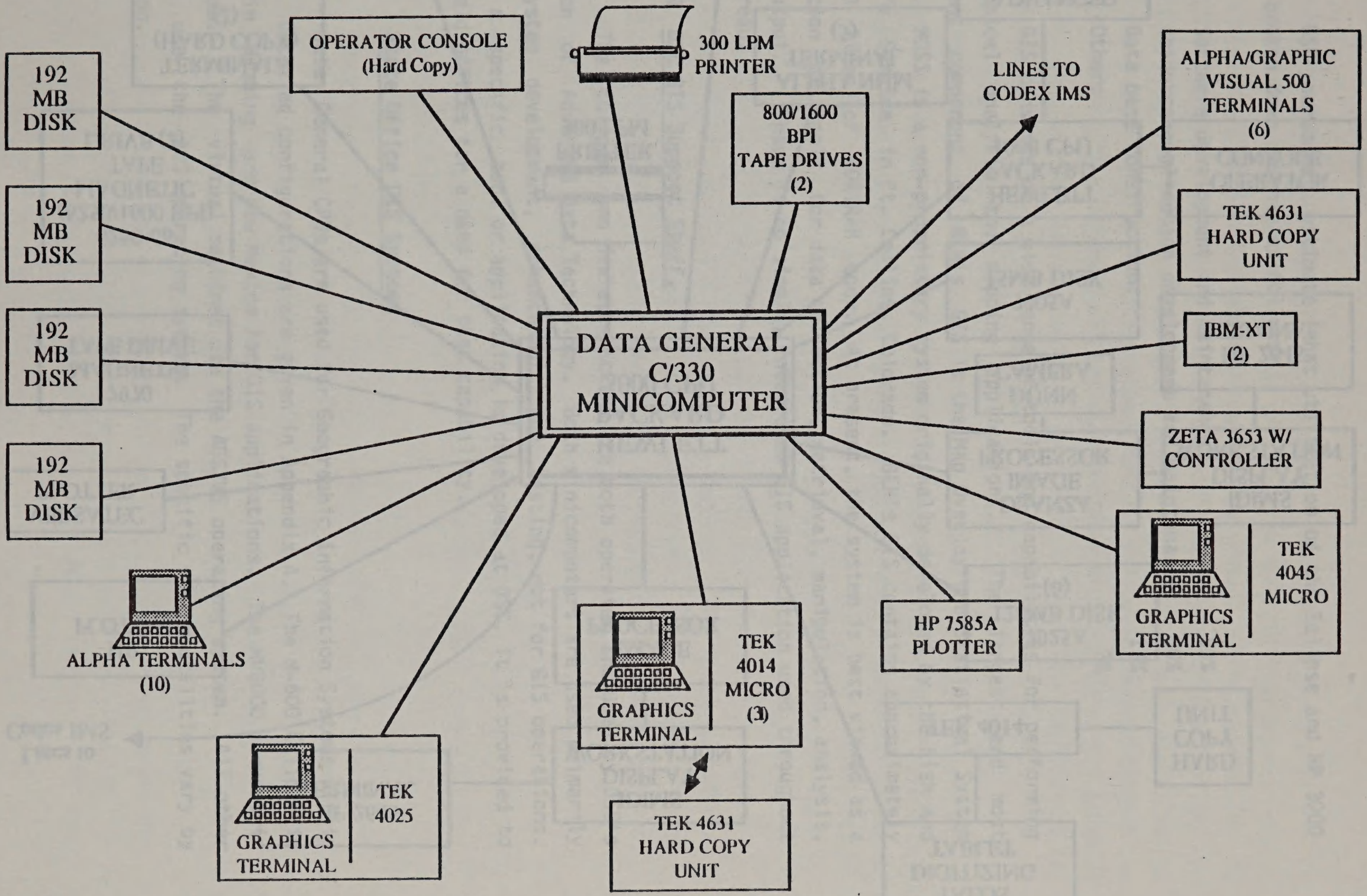
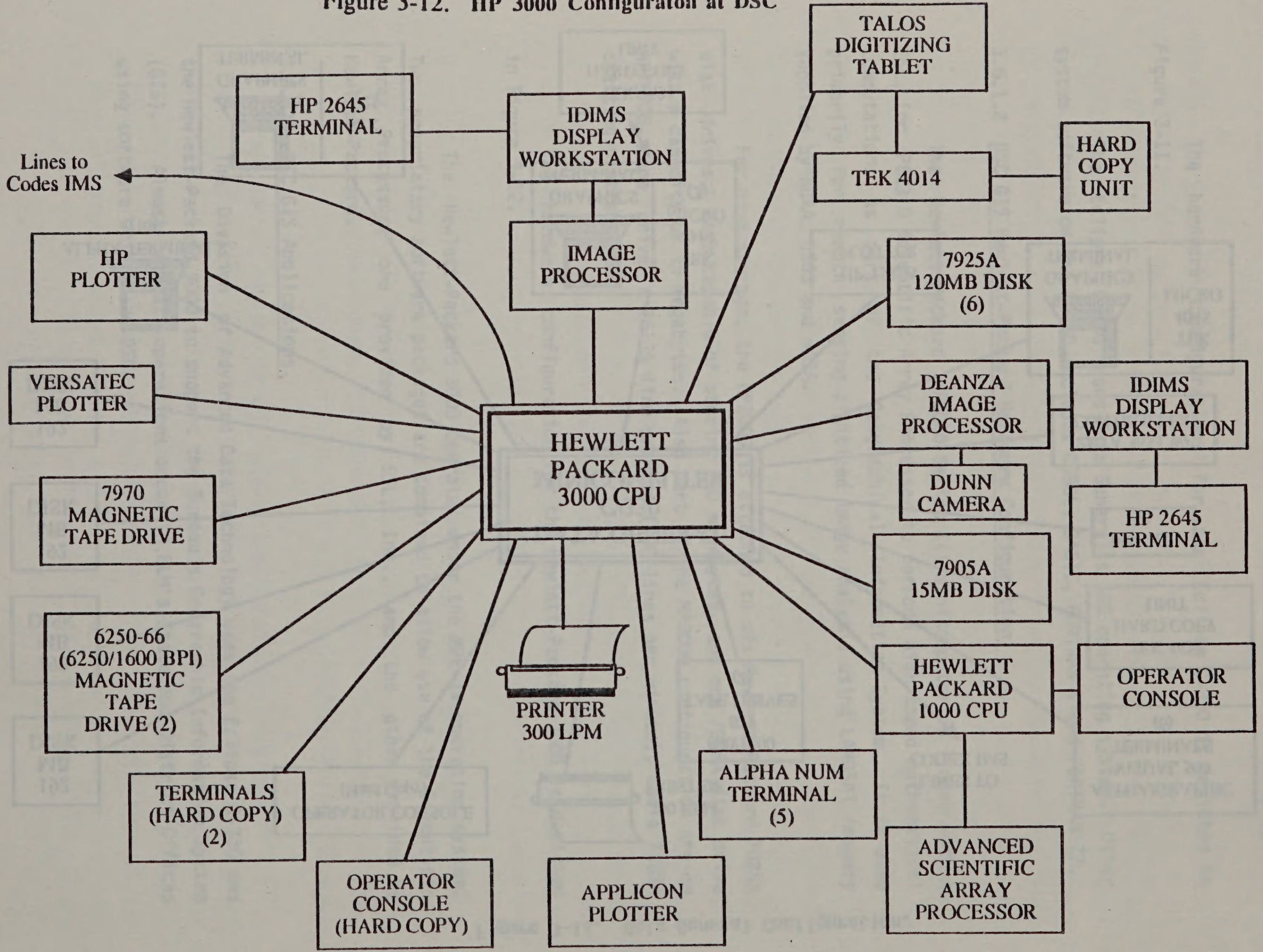


Figure 3-12. HP 3000 Configuraton at DSC



DSC personnel estimate that utilization of the Eclipse and HP 3000 can be broken down roughly as follows:

Software development and maintenance:	50%
Resource application development and maintenance:	30%
Data base construction:	13%
Other:	7%

GIS consists of a wide range of tools and capabilities for performing geographical analysis and mapping applications. The largest and most important component of BLM's GIS is the Map Overlay and Statistical System (MOSS). MOSS is a non-proprietary system originally developed by the Fish and Wildlife Service in Ft. Collins, Colorado. BLM's GIS contains approximately 500,000 lines of FORTRAN code. At present, the system is best viewed as a collection of tools for data collection, retrieval, manipulation, analysis, and output. There is no single, integrated GIS application used throughout the Bureau.

3.6.1.4 DSC GIS Support Staff.

The Eclipse and Hewlett-Packard are both operated and used by DSC's Division of Advanced Data Technology. Both minicomputers are used primarily for system development, enhancement, and testing, not for GIS operations. After a specific tool or application is developed at DSC, it is provided to BLM field offices for a need for that capability.

3.6.2 State Office GIS Systems

Data General CPUs are used for Geographic Information Systems within BLM. Detailed configurations are given in Appendix A. The M-600 Eclipse is used in Wyoming and New Mexico for GIS applications. The MV8000 is used in Colorado. The virtual machines use the AOS/VS operating system. All other models use the AOS operating system. The specific system utilities vary by location.

The State Offices use a total of 17 Data General disk drives, and two System Industries 9751 disk drives. The most common model (16 drives) is the DG 6061, which provides 192Mb of storage capacity. The DG 6236 drive is used by the Colorado and New Mexico State Offices. It provides 354Mb of storage. In addition to the DG 6061, the Wyoming State Office uses a DG 6122 with 277Mb and the two System Industries 9751 drives for data storage for a total on-line capacity of over 1.2Gb. New Mexico uses the largest number of DG disk drives (9) for a state office.

Eight of the 13 tape drives used for the Data General are Data General model 6026s; one is a model 4307H; and one is a model 6023 which is nine-track - 800 BPI, and one is a 1600/6250. All of the locations using DG equipment have at least one tape drive which could use nine-track, 800 BPI tape.

3.7 Office Automation and Personal Computers

BLM has a standard contract that provides Wang OIS office automation systems. These systems come in a variety of models. Some support only a single user, while others can support as many as 16 workstations. As office automation is not in the scope of AMS' modernization study, we have not made a detailed inventory of these systems. We have, however, included any office automation systems that were reported to us as part of the ADP inventory. We have identified at least 61 Wang OIS systems. We have not attempted to categorize these by size.

The use of personal computers or microcomputers in BLM is increasing. The first Bureau-wide microcomputer contract was awarded to Wang in FY 1984. In FY 1985 the Philips microcomputer was awarded the BLM microcomputer contract. In the State Office equipment inventories, over 400 microcomputers were included, representing 20 vendors; the distribution of their products in BLM are illustrated by Figure 3-13. The most common microcomputer is the Wang PC with 155 machines, which can now be acquired through the BLM office automation equipment contract as a word-processing and microcomputing workstation. This is a common combination of equipment functions, in both government and industry, and becoming more common as the distinction between office automation and computing continues to blur.

BLM currently uses 82 Philips PCs, which are IBM look-alikes. MS-1 is to be downloaded from the USGS Multics in October, saving over $300,000 annually in leasing fees.

There are at least 32 Northstar Advantage PCs assigned to BIFC. These PCs are linked together in a LAN configuration and are primarily used for office automation functions such as electronic mail, word processing, DBMS, electronic spreadsheet, and communication. The PCs themselves are physically located throughout the Fire Center at strategic points.

Another common PC is the IBM PC-XT (at least 10 machines), primarily due to the its processing power and the amount of software available for it. In particular, Minerals analytical programs are used on the IBM-XTs. The Wang

Figure 3-13. More than 20 microcomputer vendors were listed by the State Offices.

VENDORS	AK	AZ	BIFC	CA	CO	DSC	ESO	ID	MT	NV	NM	OR	UT	WY
Apple		2	3								2			
AT & T					1									
Beehive									1					6
Burroughs Micro								1	1					1
Compaq				1				3			2			
Data General 10; 20; 30					1	9			3	2	1	2		3
DEC Rainbow						1						1		
Hewlett Packard	3													
IBM														
PC				3		2	3							
XT				4	1	1	2				2		1	5
PC JR											3			
Intertec Superbrain				4	2		3	1			5	4	1	1
Kaypro		2				1	1					2		
Northstar			32											
Osborne			3											
Philips		20		15	15			2			8	15	7	
Sango					1									
Tandy 100											2			
TRS-80												21		
Tektronics		1		4					3				3	
Versalite			1											
Victor						1								
WANG PC		8		27		2	3	12	14	9	5	62	11	2
WANG 2200						1		1			11			

PC is theoretically IBM-compatible but the specific software used by BLM in Minerals does not work on the Wang PC.

Part of the proliferation of microcomputers in BLM and the continued demand for them may be explained by the type of user in BLM. The concept of having personal computing power which does not need to be allocated, or shared, or logged onto (and for which no procedures or rules restricts use) is attractive. Demand for microcomputers in the field offices seems to be based to a large extent on this perception. While some applications lend themselves to independent processing, others profit by sharing design, coding, maintenance, procedures and standards. Many applications planned for BLM microcomputers might reside on a shared minicomputer if such resources were easily accessed and readily available.

3.8 Other BLM Operated Computer Systems

BLM operates a number of small to mid-sized computer systems located in State Offices and field locations to handle specialized applications. These applications are operated independently for many reasons. For example, the HP9020 systems in the Oregon westside District Offices are used so that special forest modeling software developed by the US Forest Service can be used without modification. It was more cost effective to obtain the moderately priced HP9020s than use scarce staff time in converting the models to run on a BLM system.

3.8.1 BIFC Fire Supporting Data General

The Data General MV10000, located in BIFC, supports the fire fighting program. It is the biggest and most powerful of the DG CPUs in BLM with approximately 2.7 MIPS processing speed. BIFC has more DG equipment than any BLM location except ASOI DSC. In addition to the MV10000, BIFC has two MV4000 systems and many DG20 microcomputers that are also used for firefighting.

3.8.2 Burroughs Used in State Offices

Five models of Burroughs CPUs were listed in the inventories of four State Offices. The Alaska State Office uses a B2700, a mid-size minicomputer; and a B4800, a larger midrange minicomputer to run components of the AALRS land recordation system. New Mexico uses a B3185 for the State Fund Control and Accounting System. Wyoming and Montana use a small B94 minicomputer for receipt validation and processing. Idaho uses a Burroughs L-9938-200 for collections control and accounting.

For the Burroughs B-94 CPU in the Wyoming State Office, one Burroughs B9493-20 disk drive provides 20Mb of data storage capacity. In the New Mexico State Office, a Burroughs B7318 drive supports their B3185 CPU. Alaska has the largest bank of Burroughs disk drives with four B9494 drives (207Mb each) and one B9484 drive (206Mb).

3.8.3 Hewlett-Packard (HP) Used in State Offices

Four models of HP CPUs are used within BLM for non-GIS applications. A HP9836 and a HP9845 are located in BIFC to support the fire detection and management software for IAMS. The third HP CPU, an HP1000, is dedicated to the micrographics processing being conducted in Wyoming. The 9000 series CPUs all use the HP UX operating system. The HP1000 uses the RTE operating system. In Oregon, six HP 9020s and one HP-9845 are used to run sophisticated forest modeling software provided by the Forest Service.

3.9 Other ADP Capabilites, Outside BLM

BLM makes use of outside services to supplement DSC support or to provide support unavailable from DSC. For example, GTE's Dialcomm is accessed by most states and the Washington Office via Telenet. Other CPUs used by BLM, but not owned by BLM, include: the Bureau of Reclamation's Cyber in Denver, Colorado; an IBM mainframe at Bonneville Power; the USGS Honeywell Multics System; Dwights Petroleum Information Database System; AFFIRM system in Cleveland; and the USDA's Univac System in Fort Collins, Colorado. Other CPUs may also be used in the eight states not visited which were not included in the data received.

During the BLM staff interviews, four primary reasons were given for using outside services:

- To use analytical software not available within BLM,
- To use unique data not readily available within BLM,
- To share other bureau software, as mandated by the Secretary of the Interior, and
- To acquire support or system resources DSC was unable or unwilling to provide.

The most common reasons for using outside services were the first and second reasons listed. For example, Road Design software on the USDA computer in Fort Collins, Colorado, is used by BLM engineers to design access and logging roads for BLM land and hydrology software on the same system helps BLM design dams. The AFFIRMS database in Cleveland provides historical data on fire condiitons and results over the last twenty years which BLM uses to predict new fires on BLM land.

Pay/Pers, the Bureau of Reclamation's payroll and personnel system is an example of a system shared with another bureau due to Secretarial mandate. Systems sharing is likely to be increased in the future as DOI attempts to reduce investment in redundant systems. Prime candidates for these systems are Financial Management, Procurement, Property Management, and Geographic Information Systems. Workloads for these systems must be considered fairly volatile for the present since the impact on BLM's systems will vary greatly depending on whether BLM is asked to provide ADP services for other bureaus in these other systems areas or BLM is serviced by another bureau.

Some outside services are used because comparable service could not be obtained within BLM. For example, the Orgeon State Office maintains over 40 applications on the Bonneville Power Administration's IBM mainframe because DSC could not provide sufficient disk space to accommodate these applications. Not only does this involve monthly charges from system usage and storage, but OSO also paid for conversion of these programs from the BPA Cyber computer to the new BPA IBM mainframe less than six months ago.

3.10 Overall DSC Network

The BLM telecommunications network is configured similar to a tree that follows the basic shape of the BLM administrative hierarchy, with the notable exception that the root of the tree is DSC, not the Washington Office. Figure 3-14 shows the basic network structure. High speed communications lines serve as branches to connect the tree's root (at DSC) to each State Office (as shown in Figure 3-15). Each State Office, in turn, supports its District Offices with additional communications links from the State Office to the DOs. At the lowest set of branches, communications links are provided between Resource Area offices and their controlling District Office.

This simplified description deliberately ignores considerable complexity at each level in the tree. At each level from DSC to the District Offices, BLM uses significant telecommunications systems to interconnect the tree's branches. In addition, the BLM network is not managed as a single entity. Instead, DSC is responsible for communication between each State Office and DSC, while individual States control their own intrastate network. This allows significant variations of service between states, and even between District Offices within a State.

Because each State is independently responsible for intrastate telecommunications, a wide variety of equipment has been used to provide service to BLM's users. There are 25 models of network processors in the BLM inventories.

The components of the BLM telecommunications network are described in the following order:

- Internal network within the Denver Service Center
- Communications between DSC and each State Office
- Intra-state communications between State and District Offices
- Intra-state Communications to Resource Area Offices

For more detail on the specific networks used in each state, see Appendix A.

Figure 3-14. BLM's network has a tree-like structure.

BLM COMMUNICATIONS NETWORK

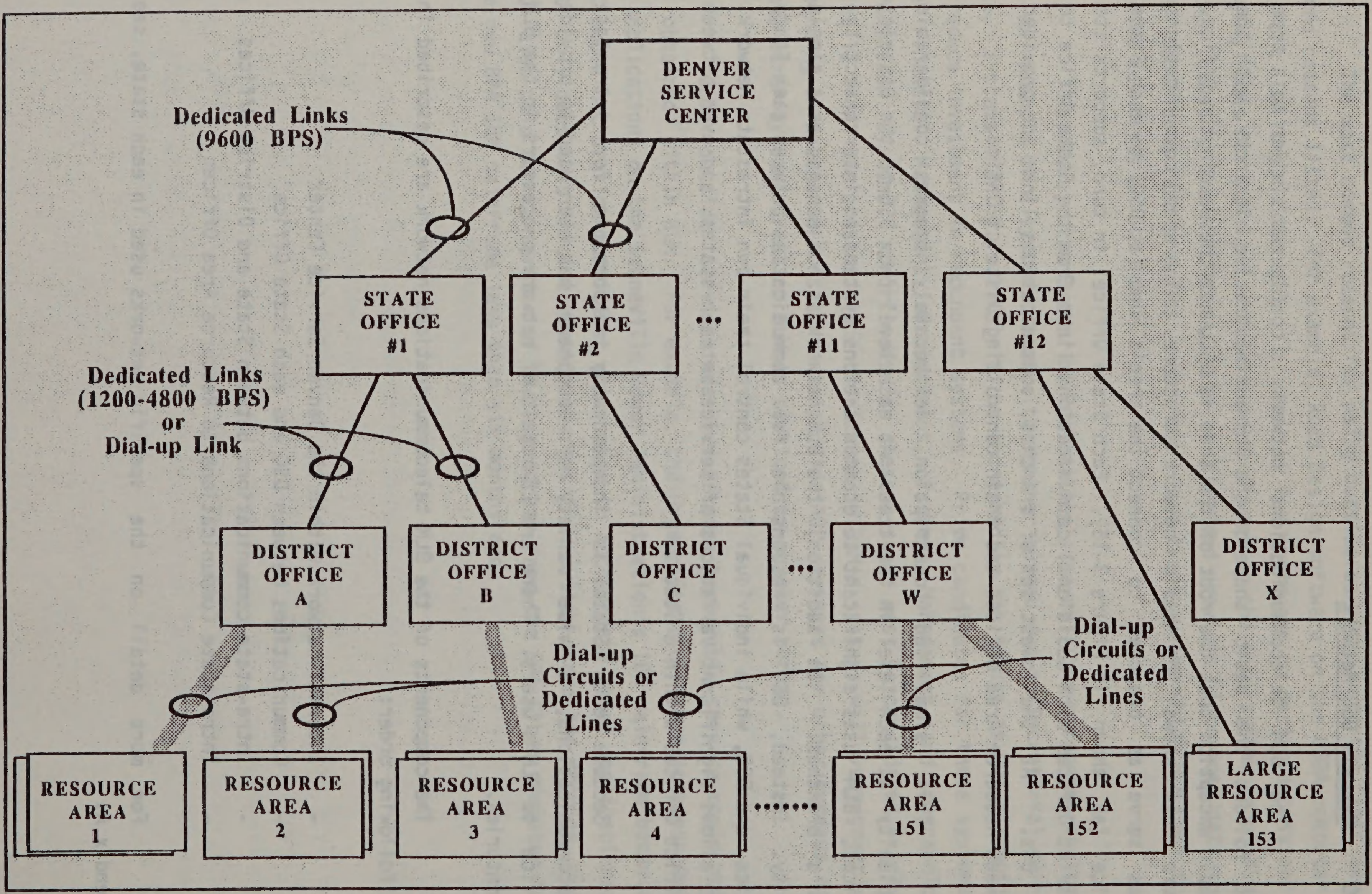
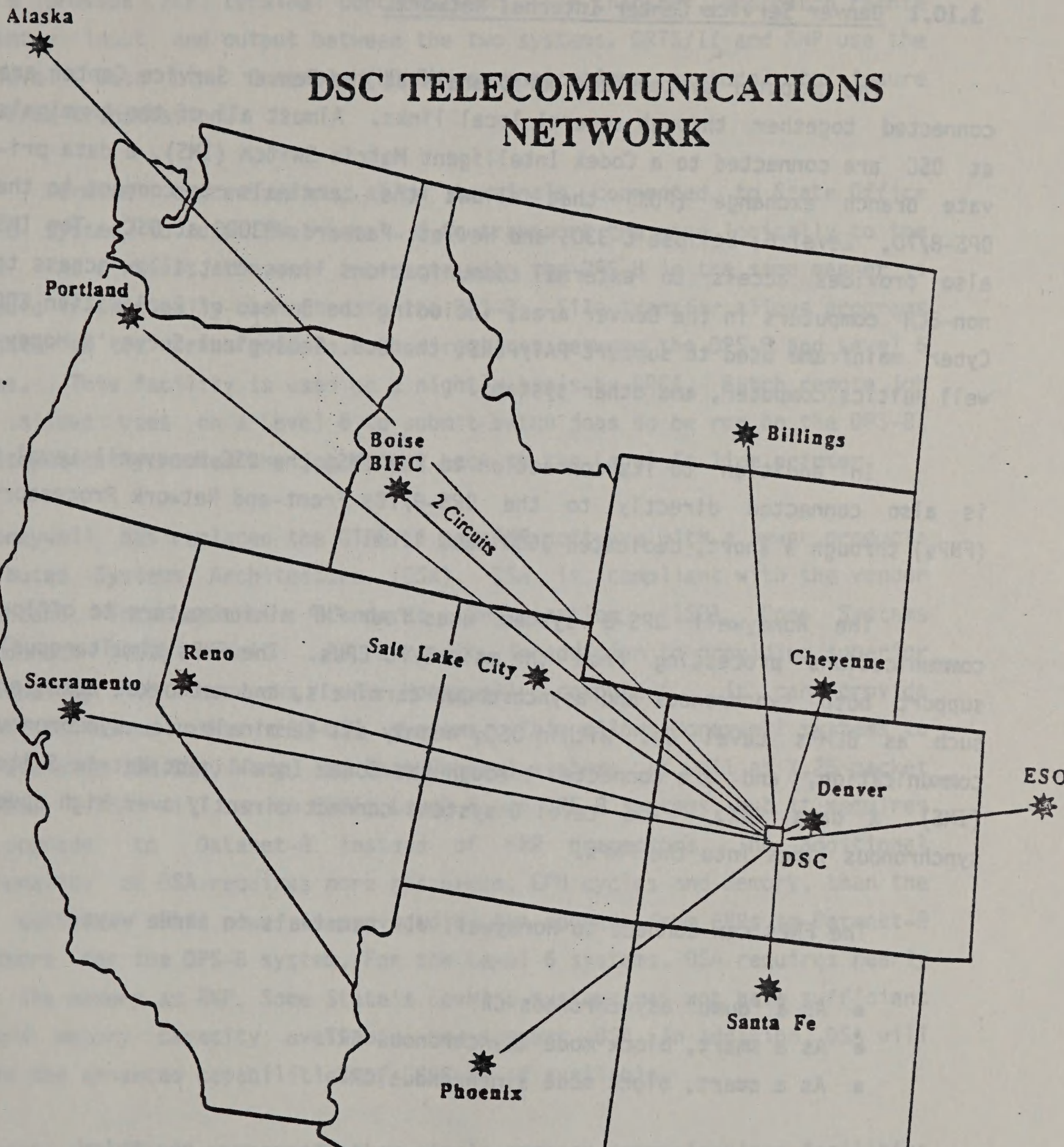


Figure 3-15. DSC has a link to every State Office.



3.10.1 Denver Service Center Internal Network.

The computer systems and peripherals at the Denver Service Center are connected together through several local links. Almost all of the terminals at DSC are connected to a Codex Intelligent Matrix Switch (IMS), a data private branch exchange (PBX) that allows the terminals to connect to the DPS-8/70, Level 6, Eclipse C-330, and Hewlett-Packard HP3000 at DSC. The IMS also provides access to external communications lines that allow access to non-BLM computers in the Denver area, including the Bureau of Reclamation CDC Cyber mainframe used to support PAY/PERS, the U.S. Geological Survey's Honeywell Multics computer, and other systems.

In addition to its connection to the IMS, the DSC Honeywell Level 6 is also connected directly to the DPS-8/70s Front-end Network Processors (FNPs) through a short, dedicated 9600 baud line.

The Honeywell DPS-8 system uses four FNP minicomputers to offload communications processing from the main 8/70 CPUs. The FNPs simultaneously support both synchronous and asynchronous terminals, and networked computers such as BLM's Level 6s. Within DSC, nearly all terminals use asynchronous communication, and are connected through the Codex Intelligent Matrix Switch (IMS), a data PBX. The Level 6 systems connect directly over high speed synchronous lines into the FNPs.

The FNPs can connect to Honeywell VIP terminals in three ways:

- As a "dumb" asynchronous CRT
- As a smart, block mode asynchronous CRT
- As a smart, block mode synchronous CRT

Within BLM, most accesses use the first method, and none use the third.

The FNPs are controlled by GRTS/II (General Remote Terminal Supervisor) software. GTRS/II provides support for locally connected terminals, and for networked connections to local and remote Level 6 systems.

Each Level 6 runs RNP (Remote Network Processor) software. The DPS-8 and Level 6 provide for terminal concentration, file transfer, and batch remote job entry input and output between the two systems. GRTS/II and RNP use the High-level Data Link Control (HDLC) communications protocol to insure error-free transmission.

Terminal concentration allow terminals connected to State Office Level 6 system to use the Level 6 to transport the user logically to the DPS-8. As a result, the user interacts with the DPS-8 in the same manner as he would if physically connected to the DPS-8. File transfer allows programs and data to be transfered in both directions between the DPS-8 and Level 6 systems. This facility is used on a nightly basis by ORCA. Batch remote job entry allows uses on a Level 6 to submit batch jobs to be run on the DPS-8, and automatically routes the job output back to the Level 6s line printer.

Honeywell has replaced the GTRS/II and RNP software with a newer product: Distributed Systems Architecture (DSA). DSA is compliant with the vendor independant International Standards Organization (ISO) Open Systems Interconnect (OSI) model. As a result, in addition to providing superior functionality to networks of Honeywell computers, it can provide communications to other ISO-OSI systems. This allows Honeywell systems to cooperate with IBM SNA, Wang, and Data General systems, as well as X.25 packet networks. DSA will run on BLM's Level 6 and DPS-8 systems, but it requires the upgrade to Datanet-8 instead of FNP processors. The additional functionality of DSA requires more resources, CPU cycles and memory, than the older software. This power is provided by the upgrade from FNPs to Datanet-8 processors for the DPS-8 system. For the Level 6 systems, DSA requires nearly twice the memory as RNP. Some State's Level 6 systems may not have sufficient CPU and memory capacity available to support DSA. In addition, DSA will utilize the enhanced capabilities of GCOS 8, if available.

There are also a number of other single-purpose communications facilities connecting individual pieces of equipment. For example, the CMC 1800 data entry machine has direct connections to the DPS-8/70 FNPs and to the Bureau of Reclamation's CDC Cyber in Building 67 of the Denver Federal Center. In addition, the data entry workstations are directly connected (hard-wired) to the CMC instead of going through the Codex IMS. Similarly, the Data General Eclipse C-330 and Hewlett-Packard 3000 have direct connections to a variety of special-purpose graphics peripherals.

3.10.2 State Office Communications with DSC.

Each of the twelve State Offices and BIFC are connected to DSC with a single, dedicated 9600 baud line, except the Colorado State Office, which uses two 4800 baud lines. Each 9600 baud line is split into two 4800 baud components:

- **Asynchronous communications.** The asynchronous (low speed) portion of each communications line is used to support users at BLM field offices who need terminal access to a system running at DSC. Each State Office typically has a local communications device, (usually a Gandalf data PBX, sometimes a CODEX IMS), used to service terminals at the State Office and, often, terminals at District and Resource Area Offices as well. Terminals are either directly connected to the Gandalf or obtain access through dial-up telephone lines. From the Gandalf, the terminal is then connected into the DSC Codex IMS using the asynchronous portion of the State Office/DSC telecommunications line, and from the IMS to the appropriate DSC computer.

- **Synchronous communications.** The synchronous (high speed) component of the DSC/State Office line supports GRTS/II to RNP communications between DSC's DPS-8/70 and the State Offices' Level 6 minicomputers. This connection provides access only to the DPS-8/70 -- no other DSC computers can be reached.

Despite the dual paths provided by the synchronous and asynchronous links, the design provides no increased reliability through redundancy as other network designs might. Although data can be multiplexed through either link, there is only a single line between points.

Thus both paths share a point of weakness. As a result the remote locations are cut off if their single communications line to their District or State Office is not operational or the transmission error rate is high.

3.10.3 State Office Networks to the Districts

Types of connections vary widely from State to State. For example, Colorado State Office had dedicated lines to every one of its District Offices but the Eastern States Office has all dial-up links for its District Offices. Oregon uses microwave channels to connect all Field Offices except Spokane to the State Office in Portland. Appendix C provides networks and configuration diagrams for each State and District Office.

3.10.4 Resource Areas Access

Resource Area access to State Office and DSC computers varies widely from State to State. Some States, such as Oregon and California, have dedicated circuits to nearly every office, while others, such as Nevada, rely upon dial-in long distance or WATS access. Other states use a combination of approaches, with dedicated circuits to some Resource Areas, and dial-in access to others.

In our interviews with BLM personnel in State, District, and Resource Area Offices, we were told that users often experience problems in obtaining and keeping telecommunications lines to DSC for on-line system access. Local phone lines were frequently cited by DSC as the source of the problem. Data communications problems, however, have also limited the extent to which field offices can use their Level 6s to print out reports generated by systems running on the DPS-8/70.

3.11 ADP Applications Inventory

In addition to the hardware inventory, an ADP applications inventory is necessary to describe where the ADP processing is being conducted physically and the specific applications software being used. In BLM, most of the applications which do not execute at DSC run at the State Office or on outside services which the Districts and Resource Areas usually access through the State Office and DSC communications equipment.

For the sake of this study, the definition of application must be interpreted broadly to include both small tracking systems and large applications such as ORCA. The knowledge of the precise content of many of these applications is distributed to the District Offices or Resource Areas and essentially unavailable. For the sake of equal treatment and expediency, all identified uses of the computer have been included as applications.

3.11.1 State Office Applications

As Figure 3-16 illustrates, most of the applications identified within BLM reside on the Honeywell computer network. Of the 147 applications identified, 134 (or 91%) reside on the Honeywell network. Of these, 107 reside at DSC and 27 reside on the State Office Level 6s. Approximately 20 reside on other State Office minicomputers, such as the DG MV10000 or the HP9020s; and over 50 reside on outside services. As the figure also illustrates, the application mix for each State varies widely with very few applications used by every State and several used by only one State.

An interesting characteristic of the BLM applications is that although the applications may reside on the DSC or State Office computers, many of the applications are supported primarily by District Office staff with very little involvement by SO or DSC ADP staff. Since detailed knowledge of the application did not reside at the State or DSC, gathering specific detail such as frequency of use and size of updates on these applications was difficult. Service center storage statistics were used to infer usage but are less than accurate since these statistics do not show data quality or importance.

Figure 3-16. BLM applications are distributed differently in each State.

		ALASKA	ARIZONA	DIEC	CALIF.	COLO.	DSC	ESO	IDAHO	MONT.	NEVADA	NEW MEX.	OREGON	UTAH	WYOMING	D.C.
DPS-8 BUREAUWIDE																
ADMINISTRATIVE SERVICES	AS	X	X		X				X		X	X		X	X	
ADOPT-A-HORSE DATA SYSTEM	HD		X		X	X		X		X	X	X	X	X		
AGING OF ACCOUNTS RECEIVABLE	FA															
APPRAISALS	AD					X			X					X		
AUTOMATED COAL LEASE DATA SYSTEM	ACLDS					X		X		X		X	X	X	X	
AUTOMATED FEDERAL AND INDIAN LEASEABLE MINERALS SYSTEM	AFILMS					X		X				X	X	X		
AUTOMATED LAND AND MINERALS RECORDATION SYSTEM	LR		X		X		X	X	X	X	X	X		X	X	
AUTOMATED LIGHTNING DETECTION SYSTEM					X	X								X	X	
AUTOMATED MANAGEMENT BY OBJECTIVES SYSTEM	MBO		X		X	X		X		X		X	X	X	X	X
B 92															X	
BUDGET MATRIX	BM		X		X	X		X		X		X	X	X	X	
CADASTRAL SURVEY FIELD NOTE SYSTEM	CS	X	X		X			X	X	X	X	X	X		X	
CHARGEBACK	FM						X					X		X	X	
CHECKS TO TREASURY	FC									X						
CORRIDOR ENVIRONMENTAL IMAPCT STATEMENT PROGRAM	EI															
DATA ELEMENT DICTIONARY SYSTEM	DD				X									X	X	
DEPOSITS-IN-TRANSIT	FD									X						
DIGITAL ELEVATION MODEL SYSTEM	DEM				X											
EASTERN STATES MINERALS	ESM							X		X						
EASTERN STATES OFFICE PATENT INDEX	ESOPI							X		X						
ECOLOGICAL SITE INVENTORY	ES					X				X			X	X		
EMERGENCY FIRE FIGHTERS	FD					X		X		X			X	X		
FINANCIAL MANAGEMENT EDITS	FE				X									X	X	
FINANCIAL MANAGEMENT REPORTS	FR				X	X		X		X			X	X	X	
FINANCIAL MANAGEMENT YEAR-END PROCESSING SYSTEM	FY				X	X		X		X			X	X	X	
FIRE COST REPORTS	FF					X		X		X	X			X		
FISCAL ACCOUNTING	FZ					X									X	X
FOREST MODELS	PM												X		X	
FOREST UTILITY PROGRAMS	PU												X		X	
GENERAL ENTRY TRANSACTION PROCESSOR SYSTEM	GETP															
GENERAL LEDGER SYSTEM	FG															
GRAZING ADMINISTRATION	GR		X											X	X	
HEALTH RISK APPRAISAL PROGRAM	HR									X						
IMPREST FUND	FI						X									
INTEGRATED HABITAT INVENTORY CLASSIFICATION SYSTEM														X		
JOB DOCUMENTATION REPORTING	JD		X		X	X	X	X		X	X		X	X	X	
LANDS AND MINERALS CASE RECORDATION SYSTEM	LMCRS				X	X		X		X	X		X	X		
LEASE MANAGEMENT	LM					X				X			X	X		
MANPOWER CORRELATION					X	X							X	X		
MATERIAL SALES	MS				X					X			X	X	X	
MINERALS MANAGEMENT	MM				X				X	X					X	
MINERALS SYSTEM-1	MS-1	X	X		X	X		X		X	X	X	X	X	X	
MINING CLAIMS	MCR	X	X		X	X	X	X	X	X	X	X	X	X	X	
MOTOR VEHICLE SYSTEM	AM				X	X		X		X			X	X	X	
OIL/GAS CASE RECORDATION	OG				X	X	X		X		X	X	X	X	X	
OPERATING BUDGET	OB		X		X	X				X						
PAYROLL COSTS	FB									X						
PAYROLL/PERSONNEL	FB/MP		X	X	X	X	X	X	X	X	X	X	X	X	X	
PERPETUAL INVENTORY	FP				X	X		X		X			X			
PERSONAL PROPERTY SYSTEM	PS		X											X		
PROCUREMENT PLANNING AND TRACKING SYSTEM	PR					X		X		X	X					

Figure 3-16. (continued)

		ALASKA	ARIZONA	BIFC	CALIF.	COLO.	DSC	ESO	IDAHO	MONT.	NEVADA	NEW MEX.	OREGON	UTAH	WYOMING	D.C.
PROGRAM MANAGEMENT	PG									X						
PROPERTY MANAGEMENT	AP		X			X		X		X	X		X	X	X	
PUBLIC DOMAIN FOREST INVENTORY SYSTEM	PD					X		X					X			
RANGE MANAGEMENT AUTOMATED SYSTEM	RM		X		X	X			X	X	X	X	X	X	X	
REIMBURSABLE BILLING	FJ															
SAGERAM - RANGELAND INVESTMENT ANALYSIS MODEL	SR					X				X			X	X		
SIMULTANEOUS OIL AND GAS	SIMO		X		X	X	X	X	X	X	X	X	X	X	X	
SOIL & WATER	SW					X				X	X					
SOLID LEASABLE MINERALS SYSTEM	SLMS	X			X	X		X	X	X	X	X		X	X	
SPECIAL PROJECTS	FO															
SPSS					X	X							X	X		
STATUS OF OBLIGATION REPORTING					X									X		
SUMMER HIRE SYSTEM	SH				X	X		X		X			X	X	X	
SUSPENSE, BUDGETARY CLEARING AND UNEARNED ACCOUNTS	FS						X							X		
TRAINING SYSTEM					X	X							X	X		
TRAVEL ADVANCE SYSTEM	FT					X				X						
USFS FOREST INVENTORY SYSTEM	PF												X		X	
VEGETATIVE AND MINERAL ADP RESOURCE SYSTEM		X	X	X	X	X			X	X	X	X	X		X	
WATERPOWER PROGRAMS	WP				X		X					X				
WILDFIRE REPORTING SYSTEM	FDR-AFFIRMS					X		X		X			X	X		
WILDLIFE INFORMATION SYSTEM	WL		X		X	X		X		X	X		X	X		
DPS-8 - STATE & LOCAL APPLICATIONS																
ACCESS TRANSPORTATION R-O-W TRACKING SYSTEM					X									X		
AIRCRAFT COST TRACKING						X								X		
APPLICATION FOR PERMIT TO DRILL TRACKING SYSTEM						X										
BAKERSFIELD DISTRICT MONITORING STATUS					X											
BAKERSFIELD DISTRICT STATISTICS					X											
CADASTRAL SURVEY PROJECT STATUS					X											
COAL RESOURCE EVALUATION PROGRAM						X										
FISH MGMT INFO SYSTEM					X											
FOREST INVENTORY SYSTEM						X										
HABITAT IMPROVEMENT AND MAINTENANCE					X	X							X			
HYDROLOGY FILES						X								X		
MAILING LISTS					X	X								X		
MAPPING PRODUCTS DB														X		
OIL SHALE AND TAR SAND ECONOMIC EVALUATION PROGRAM						X										
RAPTOR MANAGEMENT INFORMATION SYSTEM					X									X		
RARE THREATENED ENDANGERED ANIMAL DATABASE					X											
RARE THREATENED ENDANGERED PLANT DATABASE					X											
RESOURCE PROTECTION INCIDENCE DATABASE					X											
ROCKY MOUNTAIN YIELD PROGRAM						X										
SAFETY INCIDENT REPORTING														X		
STREAM FLOW						X										
TECHNICAL INVESTIGATONS						X										
TIMBER PRODUCTION CAPABILITY CLASSIFICATION						X										
TRAINING PLAN TRACKING SYSTEM					X									X		
VACANCY ANNOUCEMENT TRACKING SYSTEM						X								X		
VEGATATION AND SALES REPORTS						X								X		
WATER RIGHTS INVENTORY TRACKING					X									X		
WATERFILE						X							X			
WILDLIFE HMP STATISTICS					X									X		
WILDLIFE POPULATION AND HARVEST ESTIMATE					X											
WILDLIFE [illegible] GENERAL STATISTICS					X									X		

Figure 3-16. (continued)

	ALASKA	ARIZONA	BIFC	CALIF.	COLO.	BSC	ESO	IDAHO	MONT.	NEVADA	NEW MEX.	OREGON	UTAH	WYOMING	D.C.
WITHDRAWAL REVIEW TRACKING SYSTEM				X											
LEVEL 6 - RMP6 (REMOTE CONCETRATION FACILITY, REMOTE WATCH FACILITY, ETC.)															
APPRAISALS CASE WORK LOAD								X							
AUTOMATED LANDS & MINERALS RECORDATION		X			X					X			X		
BLM TRAINING SYSTEM		X			X			X	X		X		X		
DECLINING DEPOSIT ACCOUNTING SYSTEM		X		X					X						
MAILING LABELS		X											X		
PAY/PERS					X										
RANGE MANAGEMENT AUTOMATED SYSTEM		X						X	X	X	X		X		
LEVEL-6 - INFO B															
ARIZONA PMC ACTION TRACKING		X													
ASSET MGMT EXCHANGE SALE TRADING INVENTORY		X													
BIDDERS LIST									X						
CADASTRAL SURVEY		X													
FINANCIAL MANAGEMENT TRACKING SYSTEM		X													
IN LIEU SELECTIONSTATE LAND EXCHANGE PROGRAM		X													
MAILING LIST					X										
ORCA												X			
PROCUREMENT TRACKING		X													
PROPERTY INVENTORY					X										
RMAS												X			
SURVEY STATUS					X										
TRAVEL COSTS		X													
VOLUNTEER PROGRAM		X													
WILD HORSE & BURRO TRACKING		X													
WINTER VISITOR REGISTRATION		X													
WORKMONTH TRACKING					X										
LEVEL-6 - COBOL															
DECLINING DEPOSIT ACCOUNTING SYSTEM		X											X		
DELEGATIONS OF AUTHORITY								X		X					
ORCA				X	X	X			X			X	X		
RANGE MANAGEMENT AUTOMATED SYSTEM		X			X					X			X		
WATER RESOURCE INVENTORY		X													
LEVEL-6 - ASPEN															
LAW ENFORCEMENT AUTOMATED DETECTION SYSTEM							X								
LIBRARY REFERENCE SYSTEM									X				X		
FT. COLLINS COMPUTER CENTER												X	X		
AFFIRMS		X										X	X		
REDCARDS/FIRE PERSONNEL & TRAINING STATISTICS		X										X			
BOR CYBUR															
PAYPERS	X	X		X	X	X	X	X	X	X	X	X	X	X	
BPA - CDC COMPUTER												X			

Figure 3-16. (continued)

	ALASKA	ARIZONA	BIFC	CALIF.	COLO.	DSC	ESO	IDAHO	MONT.	NEVADA	NEW MEX.	OREGON	UTAH	WYOMING	D.C.
MISCELLANEOUS												X			
VACANCY LISTING															X
TABLE OF ORGANIZATION									X			X			
BURROUGHS												X			
ACCOUNTING AND FUND CONTROL											X				
OIL AND GAS APPLICATION SYSTEM											X				
DATA POINT												X			
DATA GENERAL												X			
ADS	X	X		X	X	X					X	X	X	X	
COS	X	X		X	X	X					X	X	X	X	
GIS GRAPHICS	X	X		X	X	X					X	X	X	X	
MAPS	X	X		X	X	X					X	X	X	X	
MOSS	X	X		X	X	X					X	X	X	X	

3.11.2 District Office and Resource Area Applications

In addition to the applications provided by the DSC and State Office computers, some District Offices and Resource Areas also have personal computers which they use for small local applications. The packaged software used include Condor Database Management System, Lotus 1-2-3 spreadsheet package, GEM-1 Analytical Software (for the IBM-PC/XT), dBase II/dBase III, Multiplan, and ASPEN. Many of these are duplications of applications developed by other Resource Areas or District Offices.

These applications are executed on over 400 microcomputers with a variety of manufacturers. Although a significant number of microcomputers are used now and will probably increase, they do not yet represent a very large population of BLM's current ADP systems. The microcomputers are not well utilized currently, both in terms of active use and in terms of efficient use of the time spent on the computer. This is primarily due to a lack of training to improve efficient machine use, software availability to encourage use, and computer literacy among BLM field staff to recognize possible applications. The field staff that we interviewed were generally unaware of any training that may be available. The software packages available in the Resource Areas and District Offices for the microcomputers is not very extensive. Also, the staff were largely unaware of computer capabilities in general and so unable to assess how a computer might be used to support their functions.

This indicates the potential for considerable hidden demand within BLM at the Resource Areas and District Offices. This demand may develop as knowledge of possible computer uses filters through the organization. BLM could accelerate this process through a conscious computer-awareness program for the BLM field staff. Although this may risk raising unrealistic expectations among the staff, it would provide BLM with a better assessment of the applicability of technology to their programs in the field.

3.12 ADP Support Personnel in the Field Offices

The ADP support organizations in the State Offices, District Offices, and Resource Areas conform to the BLM philosophy of tailoring the organizational structure to the specific needs of the programs as perceived by the State Offices. The staffing and structure of each ADP support group varies significantly from State to State.

3.12.1 State Office Support Organizations

As with equipment and applications, the number and skill level of ADP personnel available in the State Offices vary widely. As Figure 3-17 illustrates, the staff positions provided for ADP support vary from State to State. The staff available to fill these positions also impacts ADP support. For example, New Mexico, Oregon, and Utah have no analysts or computer programmers but Oregon has an Information Services Branch with a staff of 24 and separate sections for Systems Development, Telecommunications, and Data Operations. All of the States have an Information Services Organization (usually a branch), which is responsible for ADP systems support. The extent of that support depends on the level of ADP activity in that State.

Each State Office except Idaho has a Telecommunications Officer who is responsible for the State telecommunications network. In some States, such as Montana, New Mexico and Oregon, this role is defined as a full-time job. Other States assign network responsibility as a collateral duty to an ADP staff member.

3.12.2 District Office and Resource Area Support Organization

Some of the District Offices have a computer specialist who has ADP and telecommunications responsibilities, but most, like those in Nevada, depend upon ADP coordinators (collateral duty) with no ADP or telecommunications background. Nevada has one full-time computer specialist, and six District Offices. In some Districts, the computer specialist may also have data entry staff available to provide additional support. A large Resource Area may also have its own computer specialist but this is not normally the case.

Figure 3-17. ADP staff positions vary by State Office.

Support Staff	ARIZONA	CALIF.	COLO.	ESO	IDAHO	MONT.	NEVADA	NEW MEX.	OREGON	UTAH	WYOMING
ADP Manager	1		2			1	1	1		1	
Branch Chief, Information Services	1	1		1		1	1	1	1	1	1
Cartographic Technician										2	1
Chief of Operation		1									
Chief, Program Development and Support		1							1		
Clerk Typist		2	2	1					1		1
Communication Specialist	1		1						2		
Computer Assistant		1						2	1		1
Computer Operator		1	1	1	1	1		1			
Computer Programmer				1	2	2					1
Computer Programmer Analyst					1						
Computer Specialist	2	2		1	1	1	2	2	5	2	3
Computer Systems Analyst	1	2		1	1	1		2			
Computer Technician		1								2	
Data Entry Operator			1								
Data Transcriber						1		1	1		
Electronics Technician	1	1	4				3	3	1	1	2
Forester									1		
Geographer											
Geographic Information Systems Manager	1	1							1	1	1
Information Systems Manager			1		1	1					
Lead Word Processing Operater		1							3		
Management Analyst	1			1				1	1		
Natural Resources Specialist											
Peripherial Equipment Operator									1	1	
Physical Scientist									1		
Records Management Analyst				1							
Secretary							1		1		
Systems Programmer			1								1
Telecommunications Manager	1	1	1	1		1	1		1	1	1
Word Processing Manager		1	2						1		

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4. CURRENT UTILIZATION OF BLM ADP AND TELECOMMUNICATIONS SYSTEMS

4.1 Introduction

This chapter contains a summary of the data presently available to describe the current BLM ADP and data telecommunications workload as processed by the facilities described in Chapter 3. The objective of this chapter is to describe BLM's current workload in sufficient detail to develop workload projections in Task 3 (Analyze Existing and Anticipated Workloads) of the ADP Modernization Study and to support subsequent architectural and cost analysis.

Data on BLM's ADP and data communications workload will be used to make decisions on two different types of issues:

- **Overall System Architecture.** The overall system architecture deals with broad issues concerning the overall configuration of BLM's information resources including hardware, systems software, applications software, data, and telecommunications. For example, to what extent should BLM's processing capacity be centralized at one location (e.g., the Denver Service Center) as opposed to decentralized across the Bureau's field offices? How should BLM's data communications network be structured? What types of systems software (e.g., data base management systems, report generation packages, electronic mail, statistical modeling and analysis software) should be available to end users?

  The data required to identify and analyze alternative architectures need not be extremely detailed or specific. For example, an organization's overall system architecture might call for a minicomputer to be installed in each State Office, recognizing that the specific models to be used may vary from a large mini to a smaller one. Decisions on the overall ADP architecture do not require precise information. For example, field office data storage requirements can be expressed as a range (e.g., 100-200 megabytes per office) instead of as a single, precise amount.

- **Individual Component Sizing and Specification.** The overall system architecture is the framework for the implementation of specific ADP resources. The architecture must be supplemented with analysis of issues such as sizing of the hardware capabilities (e.g., printer speeds, data storage capacity, and processor sizes), specification of detailed software features (e.g., DBMS record manipulation capabilities, operating system compatibility). This refinement of the overall architecture begins to reflect the unique requirements of its offices and operations. For example, the number of terminals to be installed in each State Office would be specified based on factors such as the number of BLM employees or the amount of functional workload to be performed. Architecture component sizing and specification typically spans a period of years, covering RFP preparation and installation planning. To do this, projected workloads are needed in more detail than that required for architecture evaluation, but total accuracy and precision is not required.

The information contained in this chapter is intended to support work in identifying, evaluating, and selecting an overall ADP architecture for BLM. In subsequent project tasks the workload data acquired in this task will be used as a basis to:

- Refine our understanding of BLM's current use of its ADP resources and the exact nature of user requirements,

- Project future workloads for current operations, and develop estimates reflecting the impact of planned changes in applications and progam emphasis,

- Evaluate the technical impact of alternative ADP architectures (e.g., technical feasibility, cost-benefit trade-offs), and

- Provide workload projections for inclusion in any applicable RFP specifications to ensure that proposed ADP systems configurations meet BLM's ADP resource requirements.

The workload information presented here is based on the raw data that is available for BLM's systems. That raw data is not available for some of BLM's systems and incomplete for others. As we discuss below, any analysis of BLM's ADP and telecommunications workload is limited by the amount of information that is available. Much of what is presented here is based on estimates rather than "hard" statistics such as are typically provided by hardware performance monitoring software. In fact, much of the volume of material presented in this chapter addresses the workload on a single computer, the DPS-8 in DSC, which represents approximately 14% of BLM's installed processing capability. In addition, little telecommunication data is available for the DPS-8. Our approach, therefore, for the remainder of the ADP Modernization Project will require the use of other means to estimate workload.

The next section of this chapter contains the major findings and conclusions resulting from our analysis of BLM's current ADP workload. The following section (4.3) summarizes the current workload. Section 4.4 describes the ADP and telecommunications workload data available for BLM's systems. The remaining sections (4.5 through 4.10) describe our findings concerning the current workload for each individual computer system and the telecommunications network.

4.2 Findings and Conclusions

The findings and conclusions of our analysis of the available workload data are based upon a few basic assumptions. These assumptions are:

- **The data sample periods are representative of the BLM workload.** Data is available for the DPS-8 for October, 1985 through January, 1986. Data for the Data General systems is available from February, 1985 to February, 1986. Data for the Level 6 systems consists of a sample of a few months for the system in the DSC.

- **Computer Resource Units (CRU's) are representative of the relative use of the DPS-8 resources.** A Computer Resource Unit (CRU) is defined as an amount of resources (including CPU, memory, device activities, etc.) consumed. It is a combination of CPU cycles used multiplied by the memory used and a job urgency factor as an indication of utilization.

- **Although users may sometimes access the DPS-8 under a particular application code and then initiate the execution of another, unrelated application, the resulting workload data is still representative of the overall use of the system.**

This task to acquire and analyze workload data for BLM's ADP and telecommunications facilities resulted in the development of the following observations and conclusions:

- **Complete and accurate hardware utilization data is not available for most production ADP systems.** The only sources of system-generated workload statistics are the Charge-back System, MASTLIST, CPU utilization data, and SARA-H packages for DSC's DPS-8, the computer performance evaluation (CPE) software that DSC has developed for the Level 6 systems, SYSLOG statistics for some Data General systems, and some CPU utilization data for the Burroughs system in Alaska. The systems software implemented on the DPS-8 were not designed or developed to provide actual hardware utilization statistics. For example, the Charge-back System reports (CRU)s. The Charge-back System does not monitor use of timesharing (TSS) or transaction processing (TP/DM4). SARA-H does not monitor system overhead or CPU utilization for timesharing and transaction processing usage. The Data General statistics are also limited. They provide statistics by user account but not by application and some statistics, such as system overhead or disk channel utilization, are not available. The Level 6 CPE software collects CPU utilization, disk, and I/O data. The CPE software does not collect communication statistics and has not been extensively used.

- **Little telecommunications workload data is available and the data available is not current.** The available telecommunications workload data does not provide a representative picture of the DPS-8. For practical purposes, there is no data available for either the State Office/DSC lines or for each State's intra-state network. The only data identified partially described the DSC - State Office telecommunications workload over a five day period during 1984. Continuous BLM-wide monitoring of the telecommunications workload is needed to support effective network planning.

- **Currently available workload data alone cannot be used for projecting component sizing and specifications.** Complete CPU workload statistics are only available for the DPS-8. This system represents less than 15% of BLM's ADP capacity. Even the DPS-8 data, however, does not accurately address hardware utilization and does not generate statistics for unique components of the system. Extrapolation based on this limited information should be used with caution. Without additional, more accurate component sizing data, the development of a request for proposals or system installation, sizing and specification must be based on judgment, not quantitative analysis.

- The DPS-8 workload statistics support previous conclusions that BLM's use of ADP resources is not uniform by State Office, month, or application. We found extremely wide variations in the level of resources used among State Offices, among applications, and over time. For the five months of DPS-8 workload data analyzed, the Oregon State Office accounted for nearly three times the use of the DPS-8 as the next State Office (excluding BLM-wide applications run by DSC) but only 7% of this use was time-share. In contrast, almost 60% of the processing for Arizona was time-share. There is also considerable variation in the applications processed by each State on the DPS-8. For example, the Minerals Management system represents a large portion of Montana's batch processing (84%) while Colorado's batch processing is largely Case Recordation processing (87%). There is also considerable variation in the monthly processing cycles as demonstrated by both CPU and disk channel time variations. Finally, different applications have differing peak processing periods (e.g., summer hiring programs, financial management, grazing permits).

- There is a considerable variation in resource consumption depending on the time of day. For example, distribution of DPS-8/70 CPU utilization shows that for the sample period the CPU was under 50% utilized during 74% of the first shift but only 28% of the prime shift. In contrast, the CPU was over 85% utilized for only 6% of the first shift but almost 20% of prime shift. Also, the number of time-share users would usually peak twice during prime shift but the early peak occurred as early as 8:30 and the later peak as late as 4:30 with no apparent consistency.

- Continuing efforts should be made to gather and analyze utilization data for the Level 6s. The combined CPU power of the 15 Level 6 systems installed throughout BLM represents approximately 30% of the total CPU power installed. The recent installation of a Level 6 resources monitor will facilitate the gathering of resources utilization data. BLM should collect this data during subsequent ADP Modernization Study tasks for use in installation planning.

- Workload statistics for the DPS-8 indicate that limited additional CPU capacity is available during prime shift. Data collected indicates that 20% of the time during prime shift, DPS-8 CPU utilization is above the level at which performance degradation begins to occur.

- Workload statistics for the DPS-8 also tend to indicate the two channels currently serving the MSU501 disks are at a level of utilization where system performance will be degraded. According to industry standards, the data available shows average monthly utilization for these channels at a high level for this device type (approximately 35%). Assuming peak periods of at least twice the monthly average, indicates data I/O difficulties for these disk types at the DSC. Peak periods equal to twice the average monthly usage is not uncommon and may even be low.

4.3 Overview of BLM's Current ADP and Telecommunications Workload

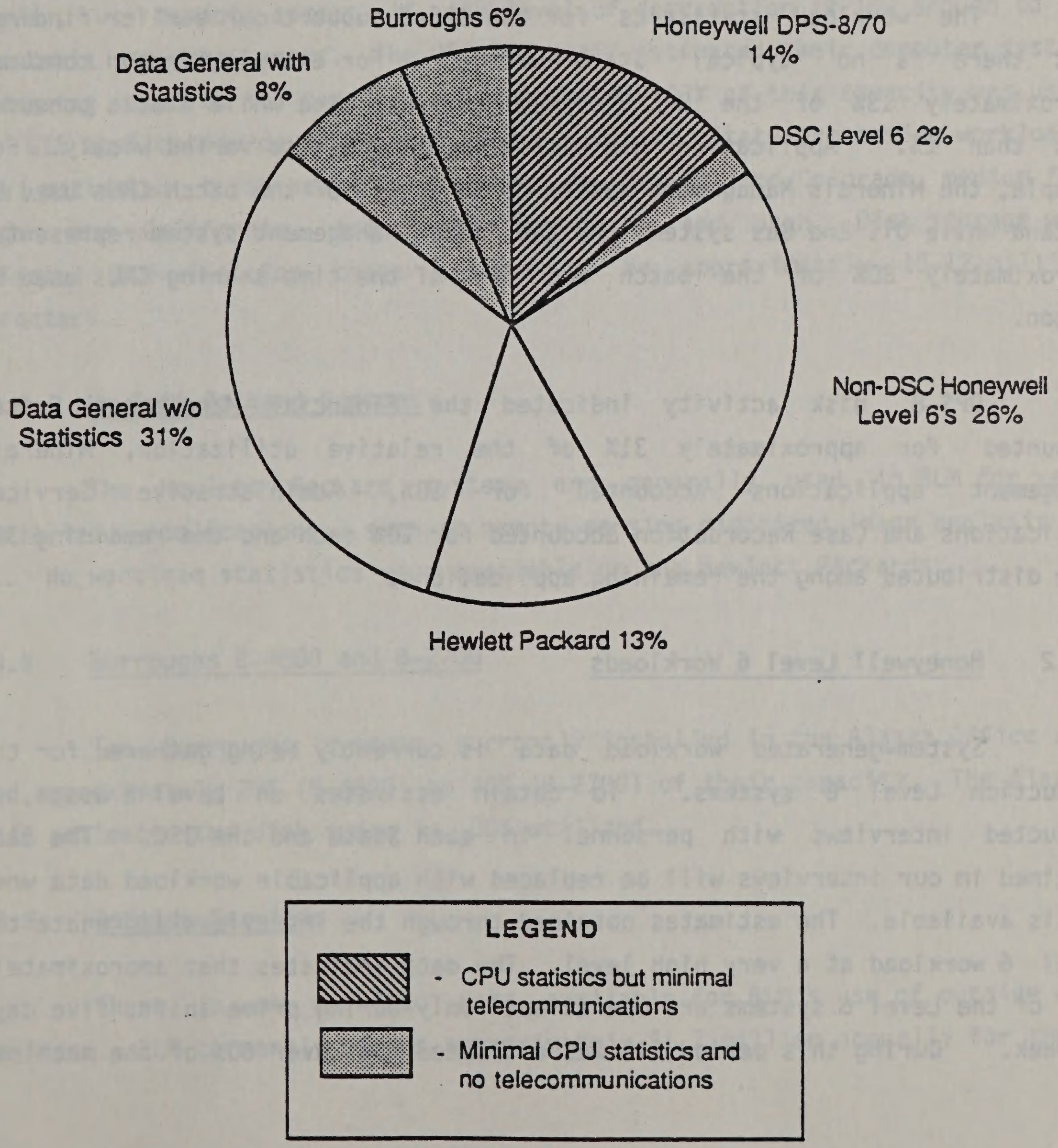
BLM's current ADP resources are essentially composed of a Honeywell DPS-8 system located at the DSC, fifteen Honeywell Level 6 Systems located at the DSC, BIFC, and in the State Offices, Data General and Hewlett-Packard Systems located throughout BLM, Burroughs B-4800 and B-2700 systems in the Alaska State Office, plus a few other small systems scattered throughout BLM. The relative processing power of these resources is illustrated in Figure 4-1. Relative performance factors provide a sense of scale to BLM's current environment and will be used to estimate the required size of architecture alternatives prior to cost comparisons later in this project. The age and diversity of the BLM computers made it impossible to find one source of relative performance factors for all of the current BLM computers. Relative processing power was calculated using relative performance factors obtained from Computerworld; Data Pro Research; Honeywell, Inc.; Burroughs Inc.; Data Decisions; and the Computer Economic Report. Common processors were found on each list and used to extrapolate the ratings for the BLM machines. As this figure indicates, 14% of BLM's relative processing power is provided by the DPS-8, 28% by the Level 6 systems and the remaining 58% provided by the other installed systems. Note that workload statistics have been provided for less than 40% of the processing power (CPE data is being collected for the State Office Level 6s).

A data telecommunications network links most of the BLM sites. High speed (14.4 Kb or 9600 baud) lines or split stream (4800/4800) lines connect DSC with each State Office. In turn, each State Office operates a network connecting the State Office with its District Offices and Resource Areas. Most States use multiplexing to the Districts at an effective rate higher than 9600 baud. Lines to the Resource Areas are generally slower speed lines.

Currently, system generated data is only available for the Honeywell DPS-8, one Level 6 system used to develop applications to be run on the other Level 6 systems, seven of the sixteen Data General systems, and the Burroughs systems in the Alaska State Office. No historic workload data is available for any of the remaining systems. Little data is available for the communications network (a small sample of the DSC to State Office load).

Figure 4-1

RELATIVE PROCESSING POWER FOR BLM CPU'S BY VENDOR



4.3.1 Honeywell DPS 8 Workload

The Honeywell DPS 8 is normally operational 3 shifts per day, seven days a week. The system is staffed with operators two shifts per day (8:00 a.m. to 12:00 midnight), five days per week. During other times, the system runs unattended. The workload on this system is generated by major, BLM wide applications such as the Financial Management System and the Range Management System as well as by general time-sharing use by the BLM field offices. Approximately 50% of use of the DPS-8 was by DSC.

The workload statistics for the DPS-8 support our earlier findings that there is no "typical" State Office. For example, Oregon consumed approximately 13% of the DPS 8 system resources used while Alaska consumed less than 1%. Application use within the States also varied widely. For example, the Minerals Management system consumed 84% of the batch CRUs used by Montana while Oil and Gas systems and the Forest Management system represented approximately 80% of the batch and 60% of the time-sharing CRUs used by Oregon.

DPS-8 disk activity indicated the Financial Management System accounted for approximately 31% of the relative utilization, Minerals Management applications accounted for 18%, Administrative Services applications and Case Recordation accounted for 10% each and the remaining 30% were distributed among the remaining applications.

4.3.2 Honeywell Level 6 Workloads

System-generated workload data is currently being gathered for the production Level 6 systems. To obtain estimates on Level 6 usage, we conducted interviews with personnel in each State and the DSC. The data obtained in our interviews will be replaced with applicable workload data when it is available. The estimates obtained through the interviews aggregate the Level 6 workload at a very high level. The data indicates that approximately 90% of the Level 6 systems are operational only during prime shift, five days a week. During this period, it was estimated that over 60% of the machines capacities were being utilized. In a few States almost no additional disk space is available.

4.3.3 Data General

The Data General systems workload estimates were obtained from our interviews with DSC GIS and Fire personnel and data provided by the SYSLOG package at four of the eight State Offices with Data General systems. This represented a wide range of CPU utilization from approximately 7.5% in California to 59% in Colorado. The 59% CPU utilization indicates that Colorado is probably experiencing performance degradataion during the day. However, we cannot assess if the level of degradation is low enough to be acceptable to the users. The DSC GIS staff estimated their computer system was being used to its capacity. Approximately 93% of this capacity was used for GIS application development purposes. Typical State processing workloads were estimated to be heavy for Wyoming, New Mexico, and Colorado, medium for Oregon and California, and light for Idaho and Utah. Disk storage was estimated BLM-wide for these systems to be approximately 10-12 billion characters.

4.3.4 Hewlett Packard Systems

The Hewlett Packard systems are generally used in BLM for very specialized applications, such as remote sensing digitized image analysis at DSC. No workload statistics were available on the Hewlett Packards.

4.3.5 Burroughs B-4800 and B-2700

The Burroughs systems currently installed in the Alaska Office are used approximately 20% (B-4800) to 40% (B-2700) of their capacity. The Alaska staff estimated the disk space is 100% utilized.

4.3.6 Outside Services

There is no workload data available for BLM's use of outside ADP services. BLM currently spends approximately $1.7 million annually for these services. The largest use is to support the PAY/PERS applications on the Bureau of Reclamation's computer. In FY85 PAY/PERS processing charges were slightly over $1 million. Another widely used outside system is the USGS Multics system ($378K) which provides the MS-1 and SLIMS packages. MS-1 is being moved from the Multics to some BLM micros to avoid some of the charges.

4.3.7 Telecommunications Workload

The only telecommunication workload data available was from a report provided by BLM. This report summarized the results of monitoring portions of the DPS 8 communications workload between the DSC and the State Offices over a 5 day period in 1984. This is a very small sample size and, in fact, may not be representative of the actual workload. This report does not address State Office to District communications. The report showed that, during the sample period, average daily asychronous line utilization ranged from less than 1% to 16%, with the maximum utilization being 28% of the capacity. Average daily synchronous transmissions both to and from State Office Level 6 systems ranged from approximately 1 million characters (Oregon) to 3.5 million characters (Colorado).

4.4 Measuring BLM's ADP and Telecommunications Workload

This section describes the workload measures typically used to determine the usage of ADP and data telecommunications systems and the workload data available for BLM's systems.

4.4.1 ADP and Data Telecommunications Workload Measurement

There are industry-standard measures which describe the hardware workload of each component of an ADP system in the detail needed to support an analysis of alternative system architectures. Major system components are typically CPU, disk, tape, print, and telecommunications, each of which has a unique set of workload measures. These statistics also are used to develop the workload specifications for an RFP to permit potential vendors to properly size the proposed systems.

- CPU utilization: is usually expressed in terms of a particular type of CPU time per clock period of time (e.g., 220 Honeywell DPS-8/70 CPU minutes per 8 hour prime shift), or in terms of percent utilization of a particular CPU type per clock period of time (e.g., 46% utilization of a Honeywell Level 6 Model 47 CPU between 8:00 AM and 4:00 PM daily).

- Disk usage: is measured in terms of data base and file size and input/output (I/O) counts per period of time. These two measures support most of the analysis of alternatives and are usually sufficient for potential vendors to size their proposed systems.

- Tape usage: is measured by the number of tape I/O's per unit of time and the number of characters per I/O. An additional measure which is useful is the number of tape mounts per unit of time.

- Print usage: is specified by the number of lines printed per unit of time.

- Telecommunication network usage: The workload data required to define a teleprocessing network is expressed in terms of:

  -- Network nodes (number and locations). The identification of network nodes facilitates the sizing of the network by defining the physical locations which must be serviced by the network.

  -- Transmission volumes. The number of characters transmitted per unit of time between (from/to) the nodes of the network

  -- Number(s) of concurrent users. The number of concurrent interactive users permits sizing of the number of teleprocessing ports, lines, modems, and front end processors.

In addition to these basic workload measures, additional information is needed to define the workload of computer systems and telecommunications networks for evaluation of alternative architectures:

- Workload by location and application; is used to assess considerations such as the costs and effectiveness of centralizing/decentralizing the processing of an application, impacts of growth and future requirements, etc.

- Time distribution of system loads; must be considered since the system must support the needs of users during all periods (e.g. sufficient resources must be available to provide adequate response times to on-line users during prime shift). If the system can support peak periods of usage, it can, by default, support normal load periods. This information can also be used to identify opportunities for load leveling, for example, transferring work from a busy shift to an underutilized shift.

- Distribution of processing between batch and on-line; is needed because of the different patterns of resource consumption between the two types of processing (e.g., on-line use requires lower average resource utilization to provide acceptable response time).

The most accurate means of acquiring and analyzing workload data is through the use of software packages developed for hardware monitoring purposes. These packages, typically known as computer performance evaluation (CPE) packages, collect the workload statistics described above.

4.4.2 Workload Data Available for BLM's Systems

As shown in Figure 4-2, system generated workload data is currently available for the DSC DPS-8, the DSC Level 6 system, some of the Data General systems and some of the systems in the Alaska State Office. This represents approximately 30% of BLM's current ADP processing capabilities.

The software packages in place on the DPS-8 were neither intended nor designed to perform hardware monitoring functions and, as a result, do not directly report hardware utilization. These packages do provide statistics on combinations of system resources used or relative resource usage. The software packages which collect workload statistics for the DPS-8 are:

- SARA-H which is a software tool that processes the Statistical Collection File (the Honeywell DPS-8 file which contains raw historical machine accounting data) to provide DPS-8 utilization statistics. SARA-H is used by BLM personnel to monitor system resource usage;

- MASTLIST which is a utility program that provides statistics on DPS-8 disk storage utilization by State and the date the data was last referenced;

- Charge-back which reports various DPS-8 system resources used. The Charge-back System also processes data contained in the Statistical Collection File and compiles this data into monthly reports. The System is currently being modified by DSC personnel. The statistics available for this study were compiled by the old Charge-back system for the period between February 1982 and September 1985. In October 1985 the charge codes used by this System were changed making the continuing comparison of this data difficult if not impossible.

Figure 4-2. System generated data is currently available for the DPS-8.

	SOURCE OF DATA				
SYSTEM	CPU	DISK	TAPE	PRINT	COMMUNICATIONS
Honeywell DPS 8/70	SARA-H, Charge-Back Sys. CPU Utilization	SARA-H, Charge-Back Sys.	Charge-Back System	Charge-Back System	FEDSIM Report
Honeywell Level 6's					
DSC	CPE	CPE	None	None	None
State Offices	Interviews[1]	None[1]	None	None[1]	None
Data General Systems	SYSLOG[2]	None	None	None	None
Hewlett-Packard Systems	Interviews	None	None	None	None
Burroughs B-4800	Utilization Reports	None	None	None	None
Burroughs B-2700	Utilization Reports	None	None	None	None

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[1] To be updated with statistics when data available.

[2] For 7 of the 16 systems.

These statistics summarize monthly utilization units for various system components (e.g. processor units and disk channel time). These units represent combinations of components of the system configuration according to an algorithm developed by Honeywell. The units are then multiplied by a dollar charge per unit.

- **CPU Utilization Data** which measures total CPU utilization; CPU utilization by the operating system, time-share applications and batch; and number of concurrent time-share users.

One additional package, TRS, was investigated and found unsuitable for workload analysis. TRS reports usage of the Honeywell DPS-8 Transaction Processing software (TP/DM4). TRS provides record-oriented information, such as number of records added or deleted, but does not provide CPU usage, I/O counts, or identify the State using the resource(s).

BLM has recently developed Computer Performance Evaluation (CPE) monitors for the State Office Level 6s. These packages were recently distributed to the State Offices and State Office personnel have been trained in their use. The State Offices are currently collecting CPE data. The software is primarily intended to assist personnel to determine causes of performance problems. Several States state that CPE uses a lot of memory and is not practical to use on a continuing basis. The only sustained use of the package has been on the Level 6 located in DSC which is used for both software development and some production. Since State Office activities vary widely from State to State, the DSC Level 6 is not likely to be representative of State Office processing profiles.

Workload for the Data General is available via a system, called SYSLOG, which collects statistics on CPU and peripheral usage by user account. However, no statistics on CPU by application or disk channel utilization are available.

The main source of telecommunications workload data is a report provided by DSC which updates an April, 1982 FEDSIM communication study. This report addressed the DSC to State Office communications links only.

The approaches we used to estimate workload for the various BLM ADP and data communications facilities are described in the following sections.

4.5 DPS-8 Workload

This Section contains our analysis of the current DPS-8 workload and the assumptions and methodologies used in this analysis.

4.5.1 DSP-8 CPU Utilization

Data describing the Honeywell DPS-8/70 CPU utilization was obtained from the CPU Utilization package, SARA-H, and the Charge-back System. The CPU Utilization data was available for 12 days, distributed over three months. Workload statistics were obtained from SARA-H and Charge-back reports for the months of March, May, August, October, November, and December of 1985 and January and February of 1986. Charge-back System data was obtained for the period FY1982 through FY1985. It should be reiterated that the design objectives for SARA-H and the Charge-back System were not to provide actual hardware utilization statistics.

We will discuss these sources in this order: CPU Utilization, SARA-H, and Charge-back.

4.5.1.1 Analysis of the DPS-8 CPU Workload Using CPU Utilization Data

The twelve day sample of CPU Utilization data provided discreet samples of CPU utilization over three months in terms of overall CPU utilization, CPU utilization by the operating system, CPU utilization by time share applications, CPU utilization by batch applications, and the number of concurrent users.

DPS-8/70 users, particularly time-share users, appear to be experiencing some performance degradation on a fairly regular basis. According to industry sources such as IBM, CPU performance begins to degrade when it exceeds 85% utilization. As Figure 4-3 illustrates, DPS-8/70 CPU utlilization exceeds 85% at some point in each of the three shifts of the sample period. The DPS-8/70 CPUs were above 85% utilization for 11% of the sample period, with peaks of 98%. During prime shift, utilization exceeded 85% for over 20% of the sample period. However, the impact of this on the users depends on their specific applications and the level of acceptable performance desired.

Figure 4-3. There are periods during each shift, when the DSC DPS-8/70 CPU exceeds 85% utilization.

Distribution of
DPS-8/70 CPU Utilization by Shift

Percent CPU Utilization

Shift	Under 50%	51% - 70%	71% - 85%	Over 85%
00:00 - 08:00	72%	17%	5%	6%
08:00 - 16:00	28%	27%	26%	19%
16:00 - 24:00	64%	21%	8%	7%

The DPS-8/70 operating system appears to be using a reasonable portion of the CPU resources being used, neither low nor excessive. The GCOS operating system varied from 2% to 20% of the CPU utilization with peaks occuring during prime shift. For over 60% of the prime shift, GCOS used between 9% and 16% of the CPU resources being used. GCOS CPU use tended to rise as the number of concurrent users or the number of batch applications increased.

As might be expected, the CPU utilization data indicates most of the time-share activity occurs during prime shift. During prime shift, time-share activity is responsible for up to one-third of the CPU utilization. The data for 77% of the two non-prime shifts showed no time-share activity although irregular peaks did occur and time-share activity tended to increase near the boundaries of the prime shift. Although prime shift time-share users and applications represented up to 35% of the CPU utilization for peak periods, time-share used from 8% to 12% for over half of the prime shift sample.

Peak batch processing utilizes up to 65% of the CPU resources by shift. Normally, batch processing was between 33% and 57% of the CPU use. The batch component of CPU utilization varies less than the operating system or time-share components. It is also more evenly distributed among all three shifts although its peak occurs during prime shift.

The DPS-8/70 has a relatively large number of concurrent users for its size. The number and physical distribution of a systems concurrent users indicate how much traffic control the operating system is required to perform and a profile for telecommunications workload. Although the CPU Utilization data did not provide physical distribution, it did provide the number of concurrent users. For prime shift, the DPS-8/70 supported between 24 and 46 concurrent users for over 85% of the sample period. The maximum number of concurrent users recorded was 78, over twice the average - 38 users.

4.5.1.2 Analysis of DPS-8 CPU Workload Using SARA-H

SARA-H CPU statistics are expressed in the form of both CRUs and processor time. Processor time is the amount of time a single CPU is actively performing application processing functions.

Analysis of the statistics provided by SARA-H is based on the following assumptions:

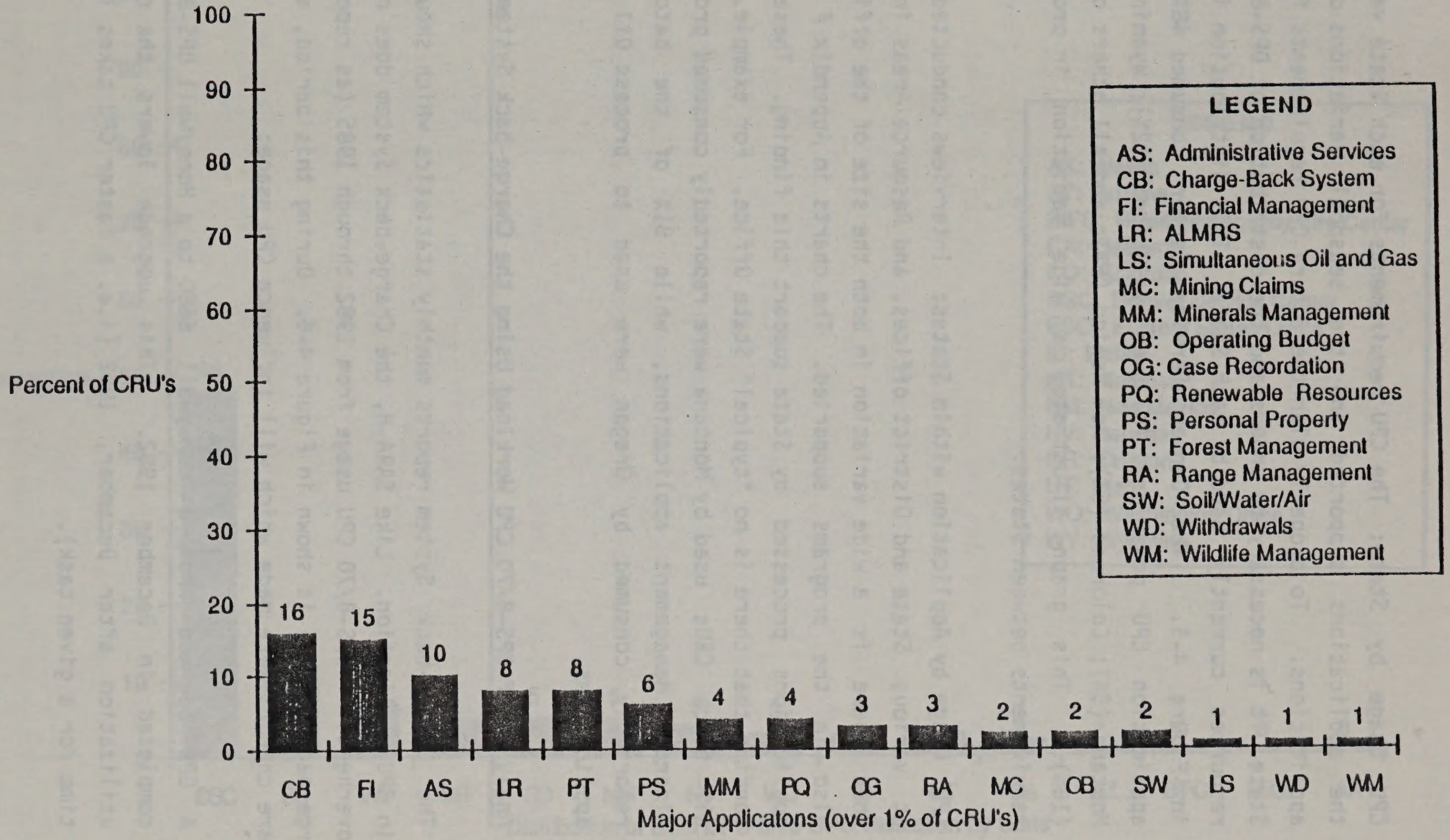
- The time periods analyzed are representative of overall DPS-8 usage. The data analyzed is for the months of March, May, August, October, and November, 1985 and January and February, 1986.

- SARA-H reports processor usage per Central Processing Unit (CPU). There are two central processing units in the Honeywell system currently installed in the Denver Service Center. As a result, the SARA-H numbers reported must be divided by 2 to represent the actual percent of the capacity used of the DSC DPS-8/70 Dual Processor.

SARA-H data was used to analyze the relative DPS-8/70 CPU usage by application (Bureau-wide), by State Office, and by application for each State Office as measured in terms of CRUs.

- CPU usage by application: The distribution of DPS-8/70 CRU usage by batch application, as reported by SARA-H, is shown in Figure 4-4. This figure illustrates that 11 of the 77 applications codes identified consume 92% of the batch CRUs for the DPS-8/70. The Charge-back System used 25% of the (batch) DPS-8 CPU used followed by: Financial Management (16%); ALMRS (15%); Fiscal Accounting (8%); Minerals Management (7%); Administrative Services (6%); Case Recordation (5%); Personal Property (3%); Range Management (3%); Mining Claims (3%); Oil and Gas (1%). We will refer to these as the 'major' batch applications. All other applications combined consumed 8% of the total CPU power used.

Figure 4-4. Major BLM batch and timeshare systems account for 86% of the CRU's for the DPS-8/70



- **CPU Usage by State:** The CPU requirements for each State vary with the applications supported and the seasonal variations of these applications. To properly plan the future CPU requirements for each State, it is necessary to understand the distribution of DPS-8/70 CPU resources currently used by each State. This distribution is shown in Figure 4-5. The Denver Service Center consumed 48% of the application CPU power used followed by: Oregon (12%); Wyoming (7%); Montana (5%); Colorado (5%); New Mexico (5%); and all others combined (16%). This graph illustrates a wide variation in processing requirements between States.

- **CPU Usage by Application within States:** Interviews conducted by AMS at various State and District offices, and Resource Areas indicated that there is a wide variation in both the size of the offices and also in the programs supported. The charts in Appendix F showing applications processed by State support this finding. These charts confirm that there is no "typical" State Office. For example, 84% of all batch CRUs used by Montana were reportedly consumed processing Minerals Management applications, while 81% of the batch CRUs reportedly consumed by Oregon were used to process Oil and Gas applications.

4.5.1.3 Analysis of DPS-8/70 CPU Workload Using the Charge-back System

The Charge-back System reports monthly statistics which should show trends in CPU utilization. Like SARA-H, the Charge-back System does not show system overhead. DPS-8/70 CPU usage from 1982 through 1985 (as reported by the Charge-back System) is shown in Figure 4-6. During this period, a number of hardware changes were made which will influence CPU usage:

- A CPU upgrade from a Honeywell 6680 to a Honeywell DPS-8/70 was completed in December 1982. This upgrade lowers the reported utilization after December, 1982 (i.e. a faster CPU takes less CPU time for a given task).

Figure 4-5. A large variation exists in state office CPU utitlization.

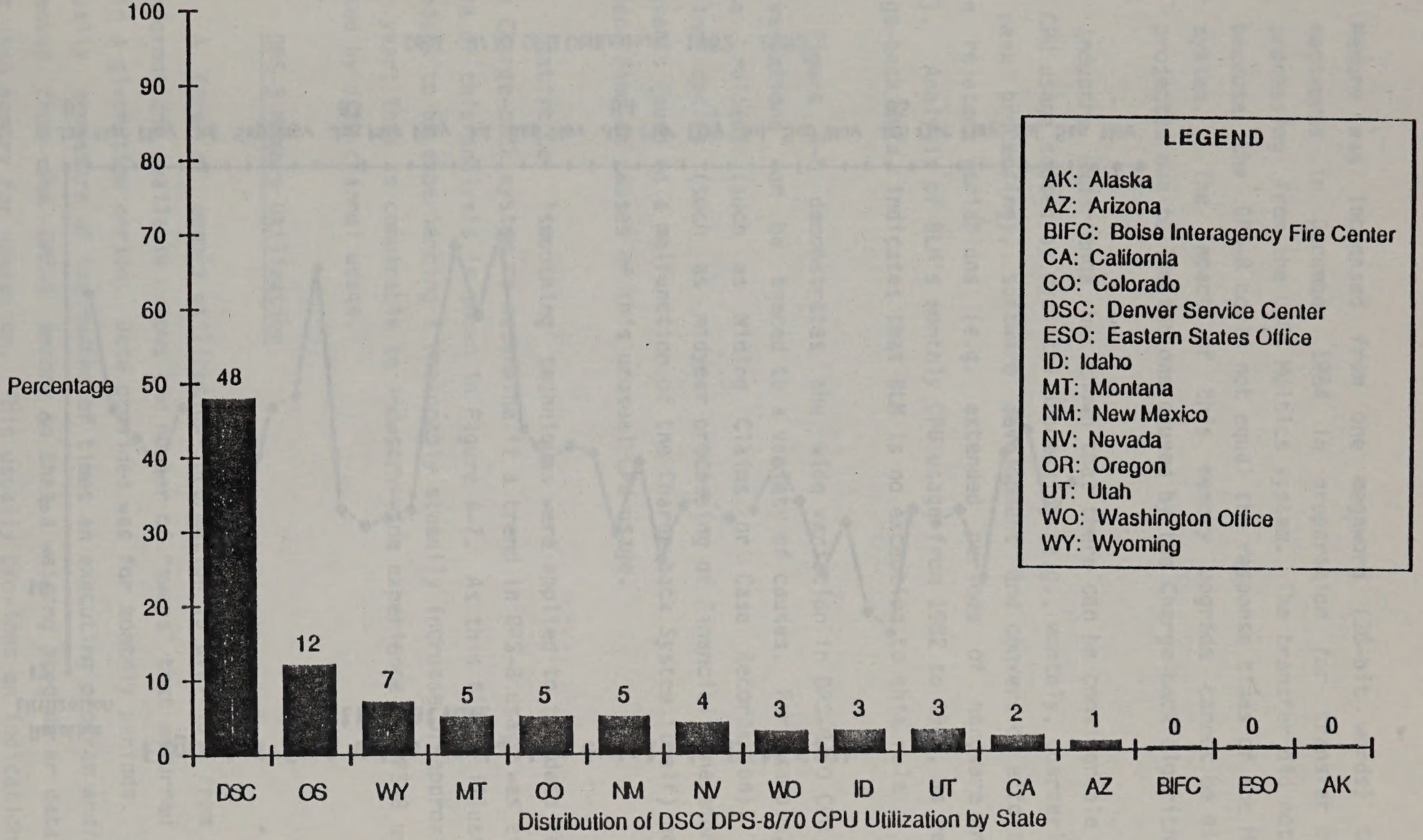
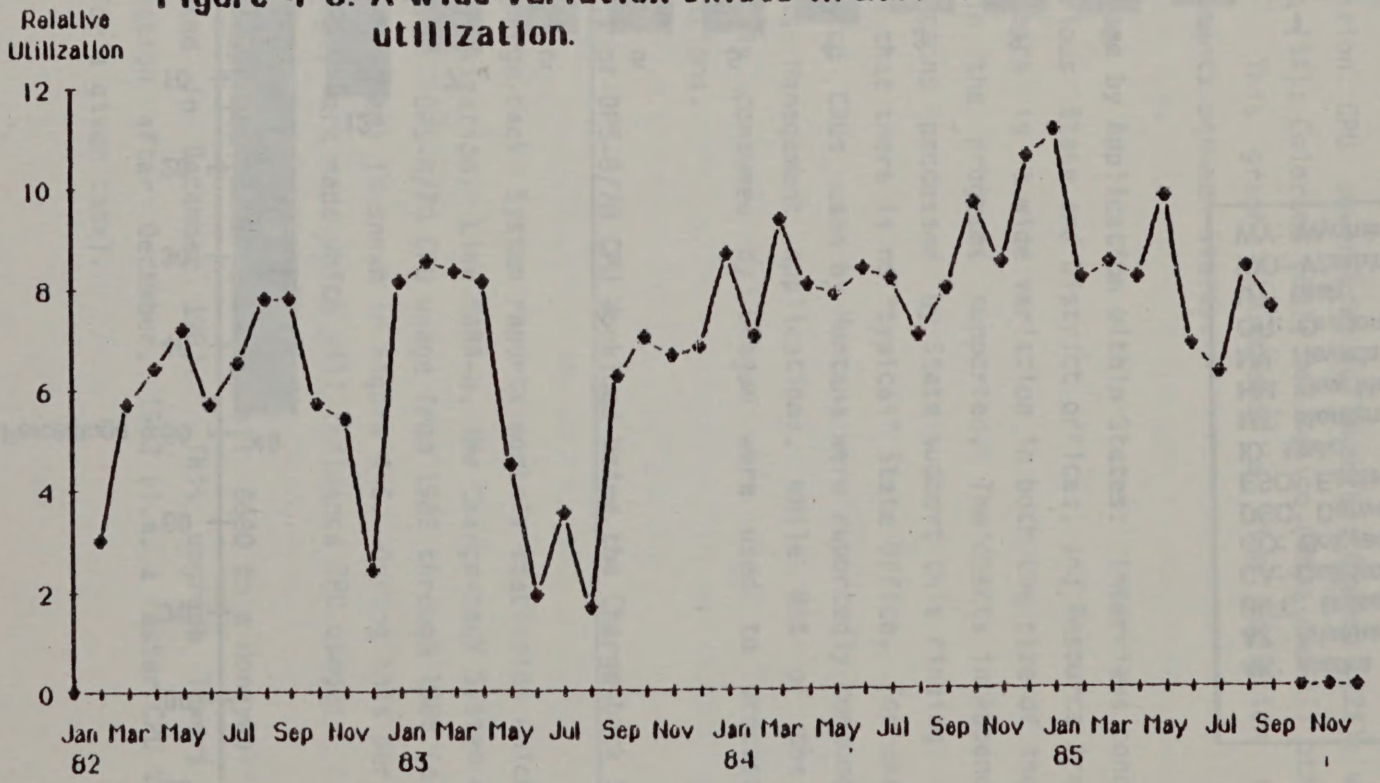


Figure 4-6. A wide variation exists in BLM CPU utilization.



DPS - 8/70 CPU Utilization; 1982 - 1985

- Memory was increased from one megaword (36-bit words) to two megawords in December 1984 in preparation for transfer of MS-1 processing from the USGS Multics system. The transfer did not occur because the DPS-8 could not equal the response times of the Multics system. The impact of this memory upgrade cannot be directly projected due to limitations caused by the Charge-back algorithm.

Industry experience has shown that there can be considerable variation in CPU usage caused by cyclical processing (e.g., monthly, quarterly, and annual peak processing), software development and conversion efforts, and hardware related variations (e.g. extended periods of hardware unavailability). Analysis of BLM's monthly CPU usage from 1982 to 1985, as reported by Charge-back data, indicates that BLM is no exception to this rule.

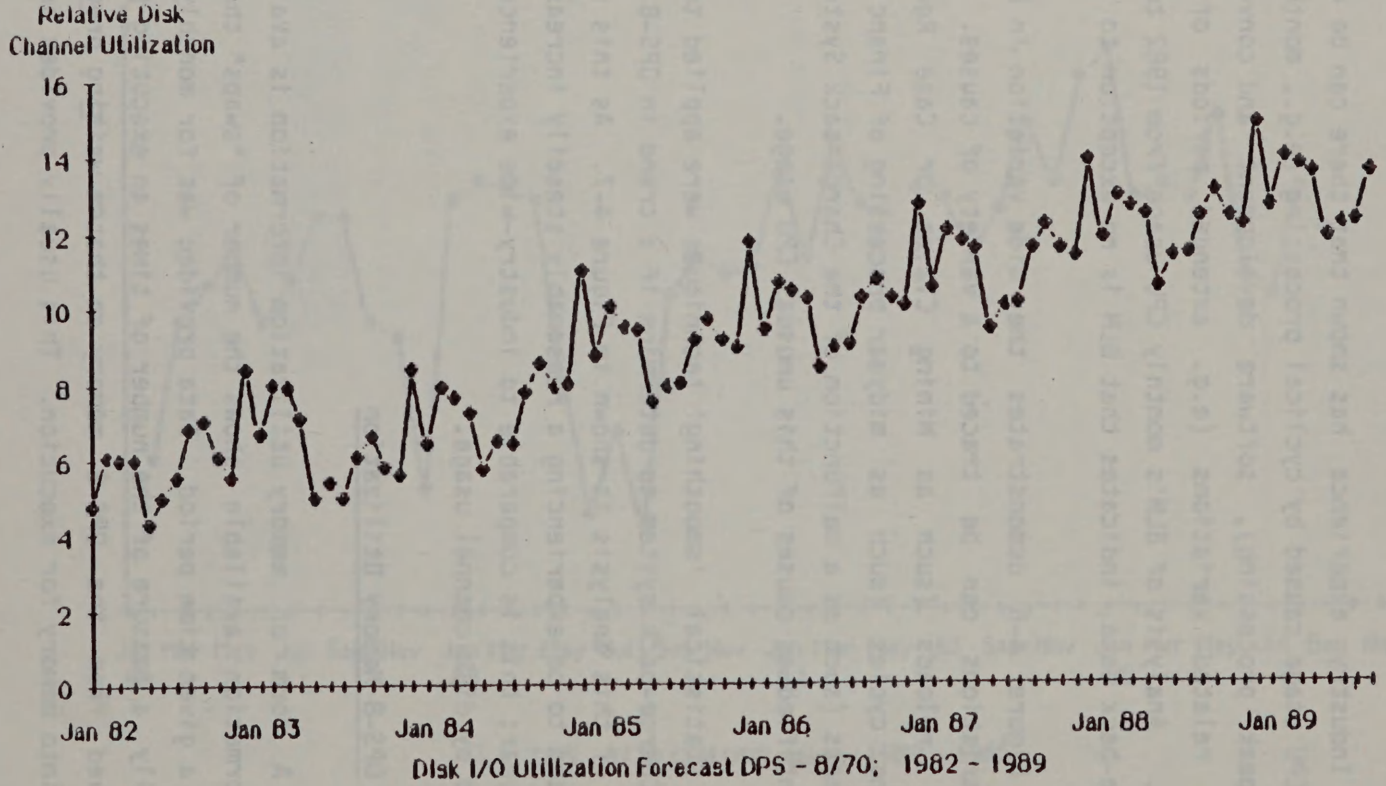
Figure 4-6 demonstrates the wide variation in DPS-8/70 CPU usage. These variations can be traced to a variety of causes. For example, large database reloads (such as Mining Claims or Case Recordation), normal processing cycles (such as midyear processing of Financial Management), or other events (such as a malfunction of the Charge-back System itself) have all been identified as causes of this unusual CPU usage.

Statistical 'smoothing' techniques were applied to the data reported by the Charge-back system to determine if a trend in DPS-8 usage was evident. A sample of this analysis is shown in Figure 4-7. As this figure illustrates, BLM appears to be experiencing a reasonably steadily increase of approximately 15% per year; this is comparable to industry-wide experience in DPS-8 usage as projected by disk channel usage.

4.5.2 DPS-8 Memory Utilization

A form of memory utilization information is available from SARA-H. The information available shows the number of "swaps" that occurred system-wide in a given time period. Data provided was for monthly periods. "SWAPS" is usually a measure of the number of times an executing program and/or data is removed from the DPS-8 memory so that a waiting program or data can be brought into memory for execution. This usually provides an indication of

Figure 4-7. BLM's relative disk channel utilization has been projected to 1989 based on statistics gathered from 1982 - 85.



contention for memory. AMS contacted Honeywell personnel responsible for SARA-H reporting (Phoenix, Arizona) to confirm the definition ["swaps"] and, if so defined, to determine if the total swaps and swap hours reported were within "recommended" operating guidelines. Honeywell personnel indicated that our understanding was corect but agreed that the data required to analyze the memory utilization must be for shorter periods of time than a monthly shift summary (i.e., "average" utilization across a month will not identify over-utilization problems which may be experienced for shorter time periods). Therefore, no valid conclusions on memory utilization could be made.

4.5.3 DPS-8 Disk Usage

Charge-back System reports for FY82 through FY85, as summarized in Figure 4-8, show relative disk channel times. These relative disk channel times are felt to be representative of the growth of the DPS -8 disk workload. The scale and components included in this data (latency time, seeks, reads, etc.) are not reported by the Charge-back System.

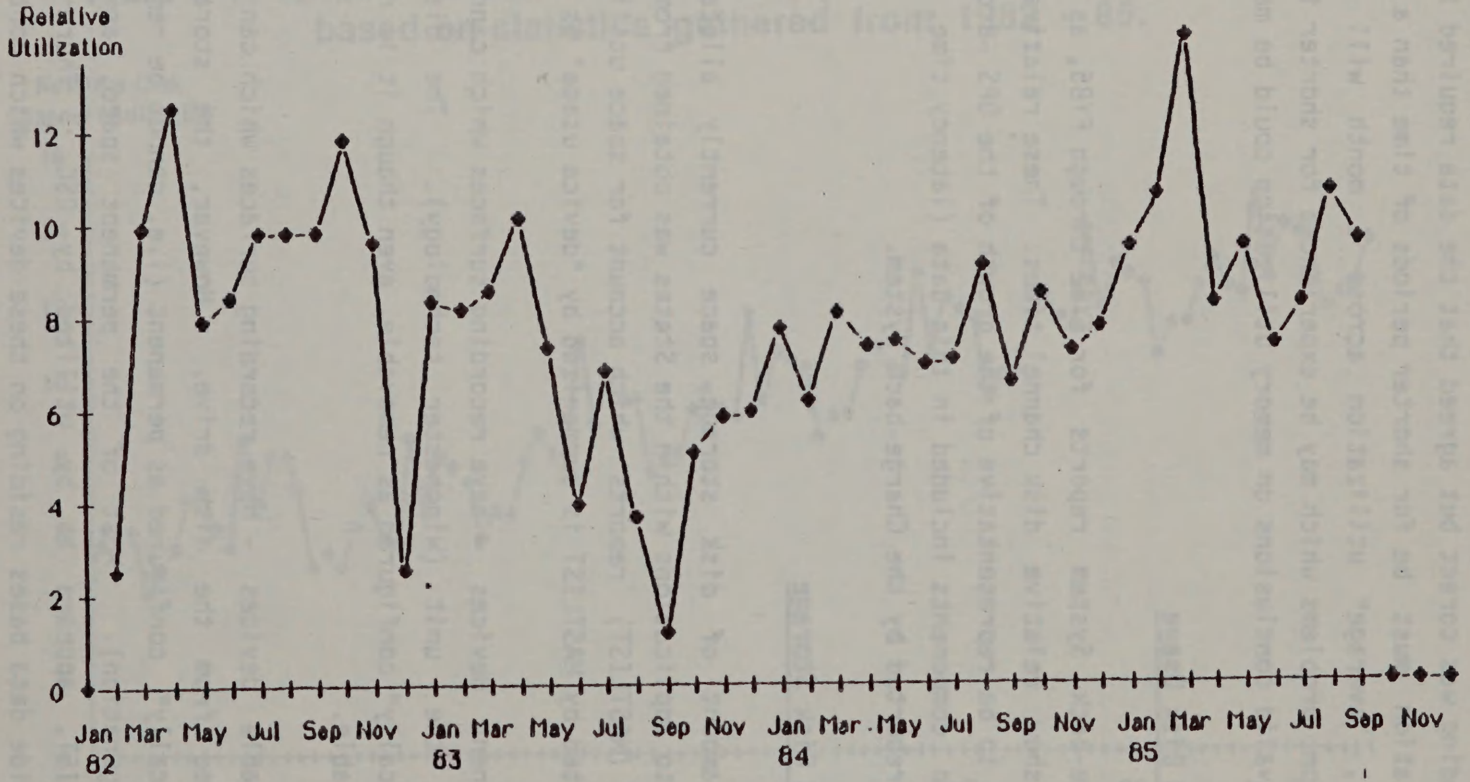
4.5.3.1 DPS-8 Disk Storage

The amount of disk storage space currently allocated to State Offices, and to applications within the States was obtained from various Mass Storage List (MASTLIST) reports which account for space utilized by State. The data reported by MASTLIST is summarized by "device usage" as follows:

- Permanent devices - have recording surfaces which cannot be removed from the unit (Winchester technology). The disk device is "logically" configured as removable, even though it is not physically removable.

- Removable devices - have recording surfaces which can be physically removed from the disk drive. However, the storage space is "logically" configured as permanent (i.e. cannot be removed from the configuration). Most of the permanent space, as reported by MASTLIST, appears to by utilized by DSC. There are, however, BLM-wide data bases residing on these devices which contain data from the various States. Further analysis is required to distribute the appropriate amount of this space to individual States.

Figure 4-8. Disk channel time demonstrates a wide variation in processing load.



Charge-Back System Relative DPS - 8/70 Disk Channel Time; 1982 - 1985

- Additional removable devices, which can be physically removed from the system (i.e. physically removable recording surfaces and "logically" configured as removable by the system) are referred to in this report as "Shelf" devices (i.e. the packs are typically stored in the library and are mounted by the system operator as required.

Disk storage usage is reported by MASTLIST in "little links" (LLINK) the basic unit of allocation under the GCOS III operating system. Each LLINK is a fixed block containing 320 words of data. The 36-bit words can contain either four EBCDIC characters (8-bits), or six BCD characters (6-bits). This yields 1280 bytes per LLINK for EBCDIC, and 1920 bytes per LLINK for BCD storage. In this paper, an average of 1,500 characters per LLINK is used.

4.5.3.2 DPS-8 Disk Usage Distribution by State

The distribution of disk space allocated by State, as reported by MASTLIST, is shown in Figures 4-9 and 4-10. Figure 4-9 distributes the combined permanent and removable space by State. The permanent space assigned to DSC contains data bases which are "shared" by the States and as such cannot be distributed to the States.

Figure 4-10 distributes the "shelf" space allocated by State. These disk packs are mounted as required and upon the availability of disk drives. Although the data contained on these disk packs may not be required online at all times, this space must be considered when performing an inventory of total space used by a State.

DSC has a large percentage of its permanent disk dedicated to infrequently used files. Based on the Disk Summary Report, 17% of the permanent disk storage used on the DPS-8 has not been used in the last 180 days. This represents approximately 431 megabytes of storage. DSC may be able to provide additional disk space to users without additional investment by archiving some of these files.

Figure 4-9. DSC little links include state data storage.

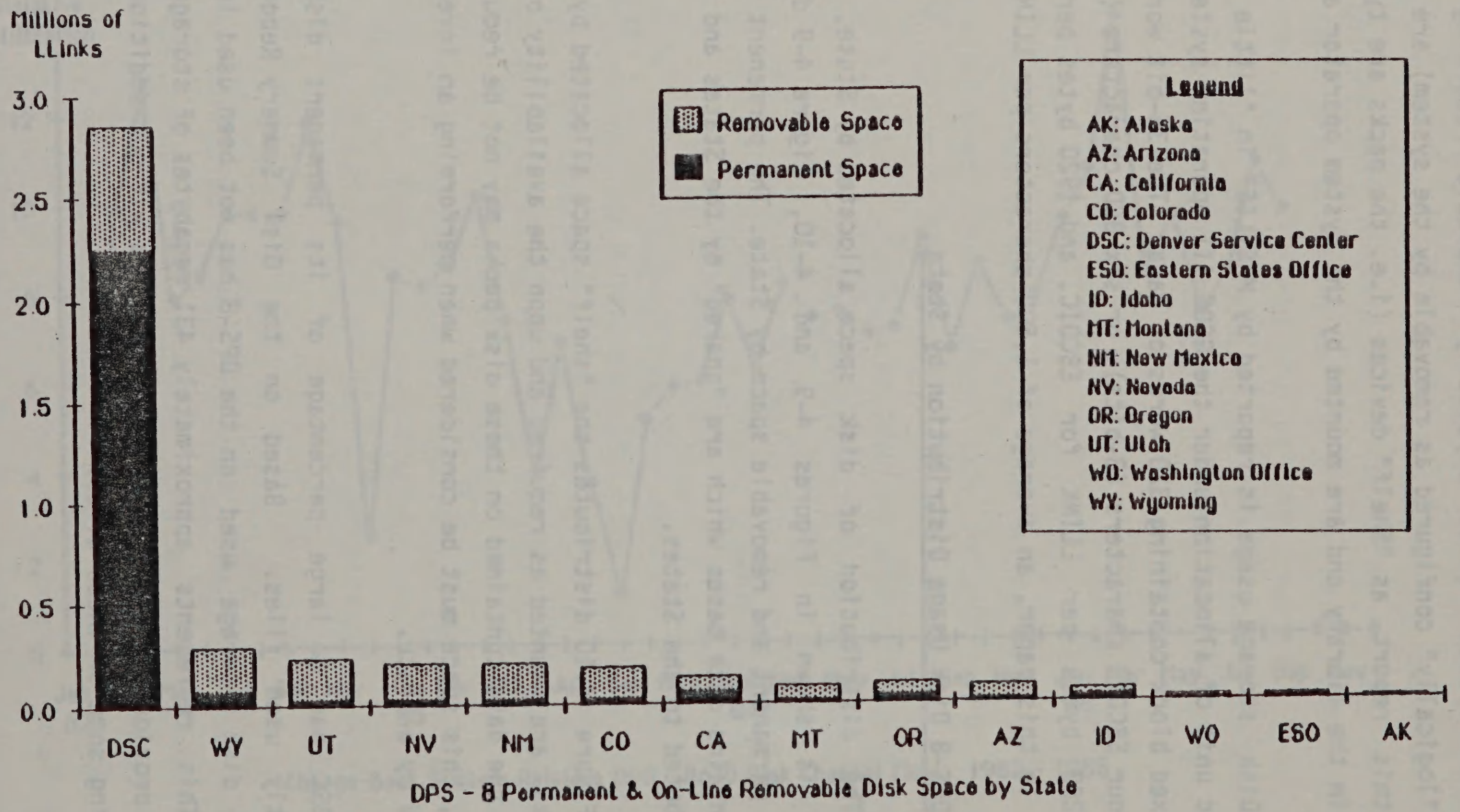
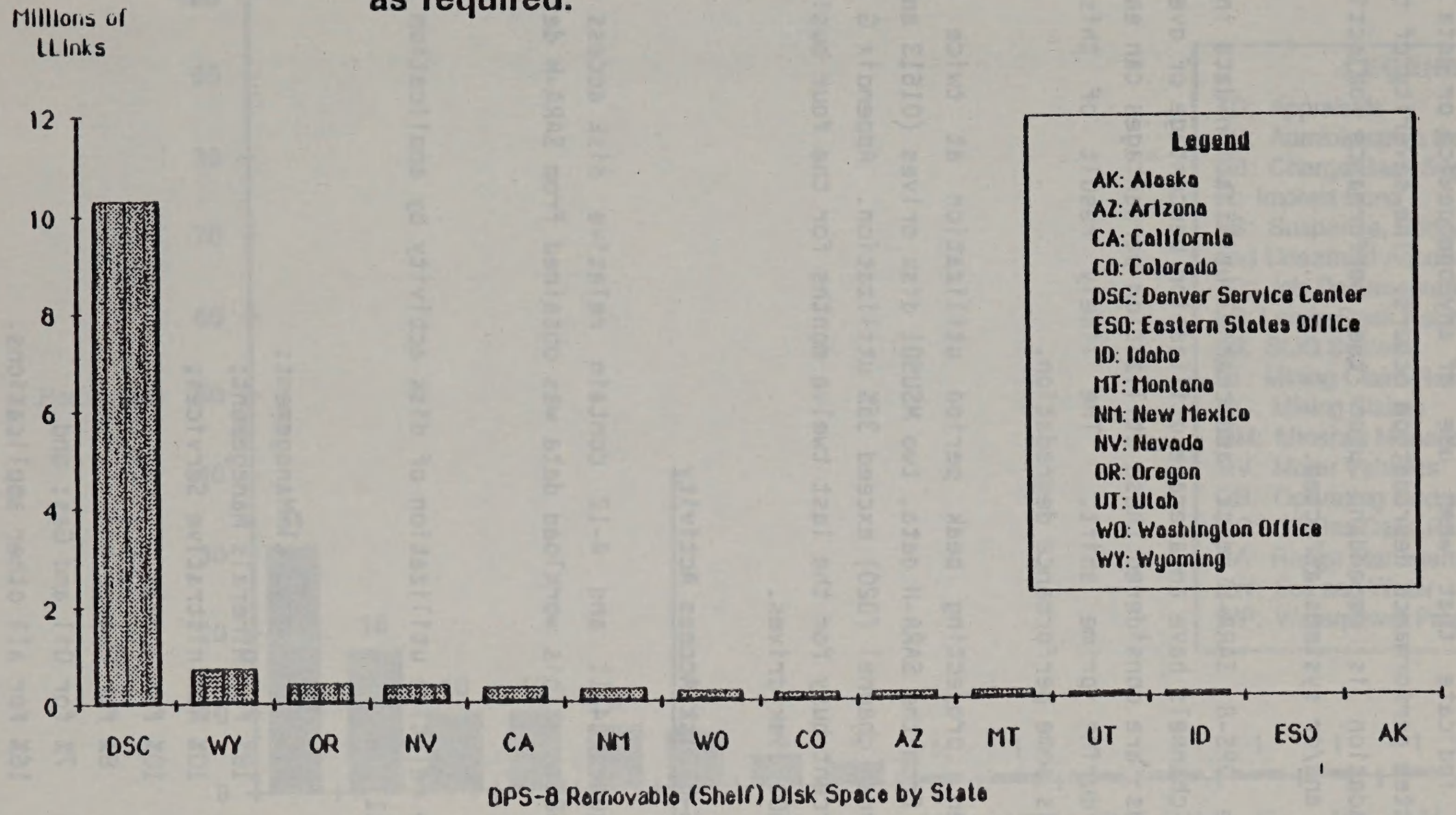


Figure 4-10. Shelf removable disk space is on line storage, which is mounted as required.



4.5.3.3 DPS-8 Disk and Channel Utilization

Industry guidelines and experience regarding disk and channel utilization indicate that when use of any one device or data path exceeds 30%-35%, system performance degradation occurs. The severity of the impact of this degradation is dependant upon the performance objectives of the application and/or systems affected.

The DPS-8 SARA-H disk and channel utilization data indicates both MSU501 disk channels have an average utilization percentage of over 35%. When peak periods are considered these utilization percentages can easily double, especially during prime shift. The likely result of this utilization percentage is some performance degradation.

When projecting peak period utilization at twice the average utilization from the SARA-H data, two MSU501 disk drives (01613 and 11616) and one additional channel (020) exceed 35% utilization. Appendix G provides the average percent busy for the last twelve months for the four busiest channels and the MSU501 disk drives.

4.5.3.4 DPS-8 Disk Access Activity

Figures 4-11 and 4-12 contain relative disk access activity for October, 1985. This workload data was obtained from SARA-H data. This data shows:

- The relative utilization of disk activity by application area (Figure 4-11), are:
  - 31% for Financial Management;
  - 18% for Minerals Management;
  - 10% Administrative Services;
  - 10% for ALMRS;
  - 8% for Charge-back;
  - 7% for Oil and Gas; and
  - 16% for all other applications.
- The major users of disk channel activity (Figure 4-12) are:

Figure 4-11. Financial management applications use 31% of the disk accesses.

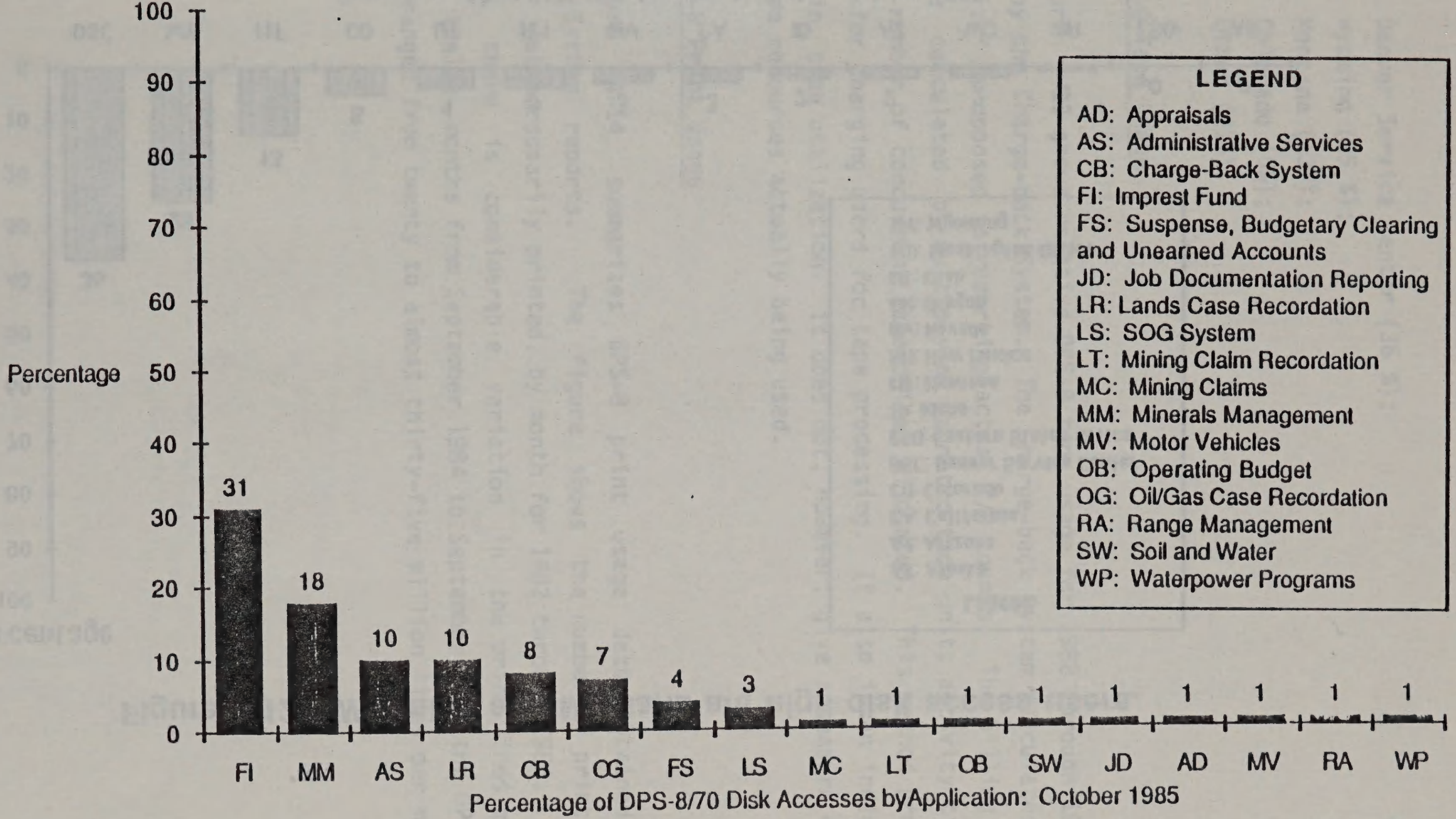
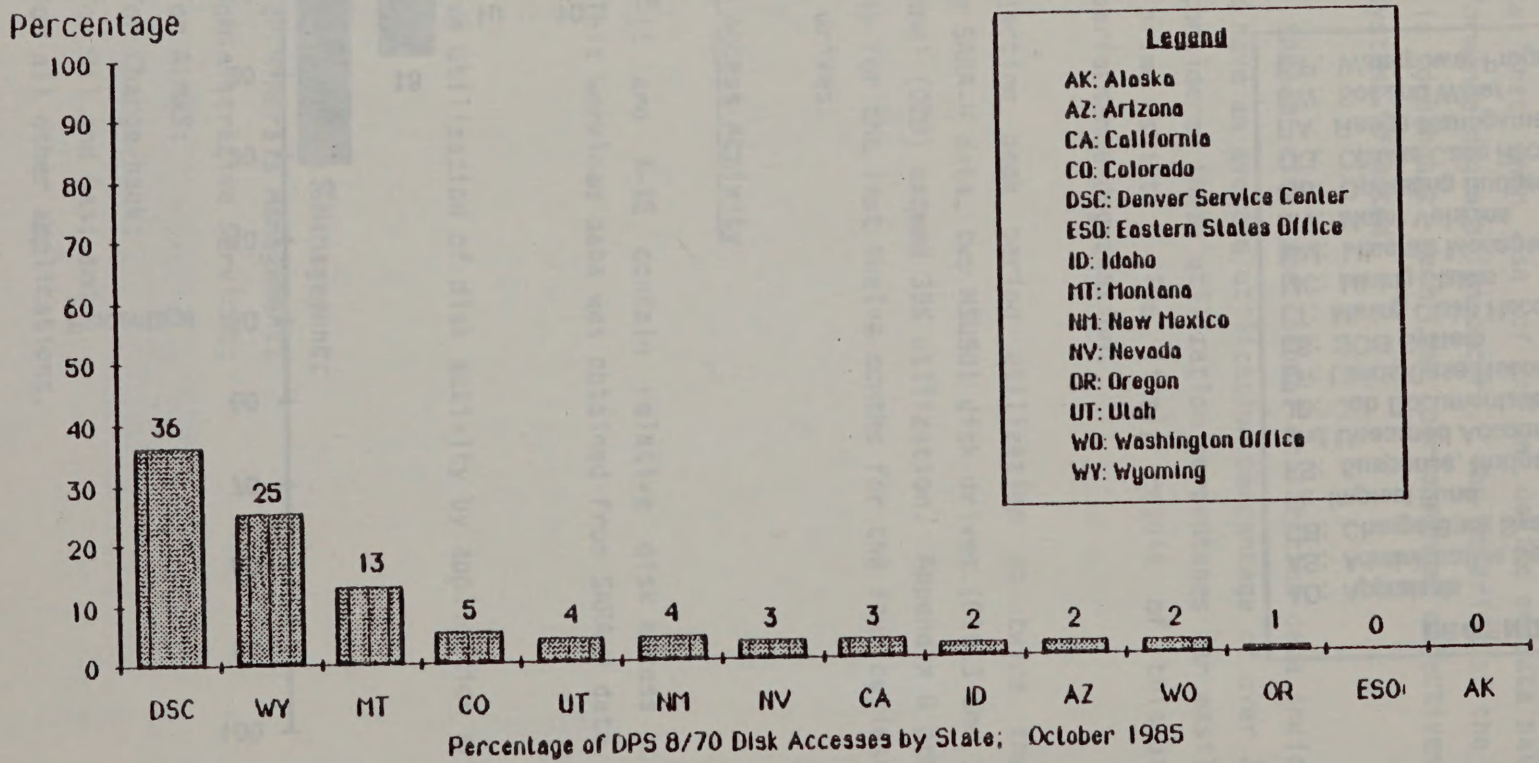


Figure 4-12. Wyoming and Montana are high disk access users.



- Denver Service Center (36 %);
- Wyoming (25 %);
- Montana (13%);
- Colorado (5%);
- Other (21%).

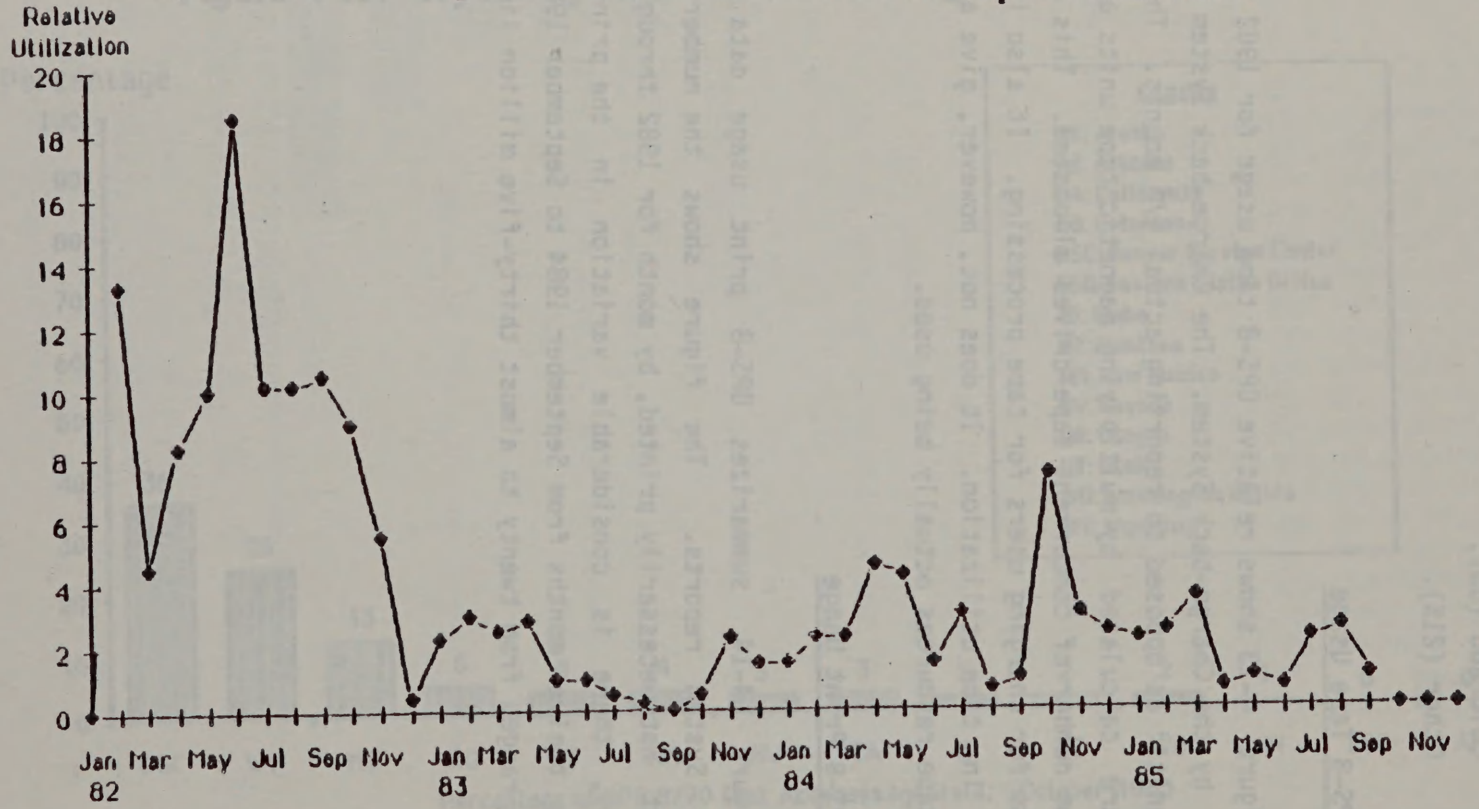
4.5.4 DPS-8 Tape Usage

Figure 4-13 shows relative DPS-8 tape usage for 1982 through 1985 as calculated by the Charge-back System. The Charge-back System calculates tape "billing units" as opposed to reporting actual I/O counts. The billing units reported are calculated by multiplying magnetic tape units activity time by the maximum number of concurrent tape drives allocated. This method provides a mechanism for charging users for tape processing. It also is an indication of trends in tape utilization. It does not, however, give a measure of the amount of tape resources actually being used.

4.5.5 DPS-8 Print Usage

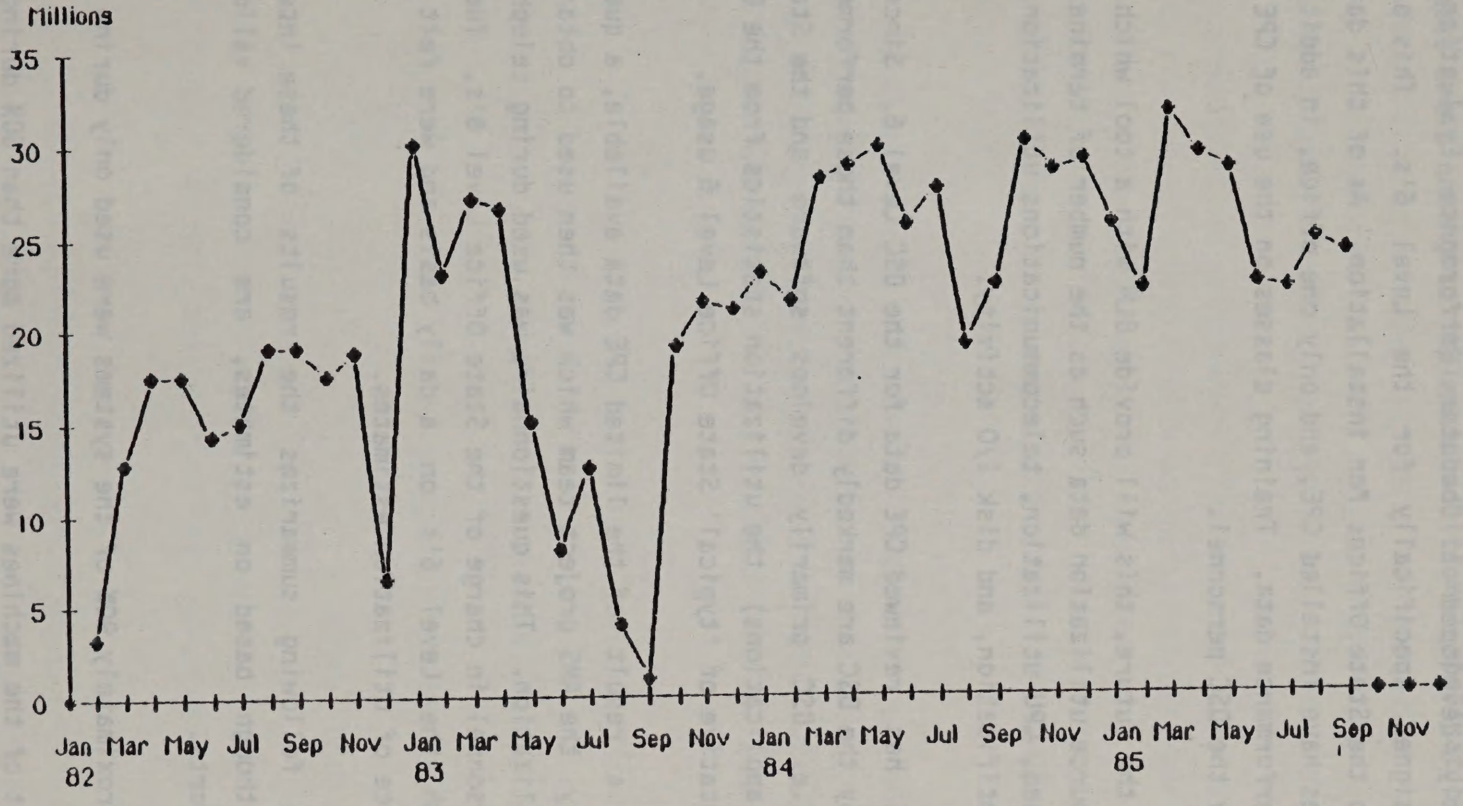
Figure 4-14 summarizes DPS-8 print usage data obtained from Charge-back System reports. The figure shows the number of print lines queued, but not necessarily printed, by month for 1982 through 1985. As the chart shows, there is considerable variation in the print lines queued. During the twelve months from September 1984 to September 1985 the DPS-8/70 print usage ranged from twenty to almost thirty-five million lines per month.

Figure 4-13. Large variations exist in BLM tape utilization.



DPS - 8/70 Relative Tape Utilization; 1982 - 1985

Figure 4-14. Large variations exist in number of print lines.



DPS - 8/70 Print Lines (Millions); 1982 - 1985

4.6 Honeywell Level 6 Systems Workload

Hardware utilization data is currently being collected for the State Office Level 6 systems. As previously indicated, BLM and Honeywell personnel have recently developed a Computer Performance Evaluation (CPE) software package designed specifically for the Level 6's. This package has been delivered to the State Offices for installation. As of this date, four of the State Offices have installed CPE, and only one office, in addition to DSC, has collected performance data. Training classes on the use of CPE have also been conducted by the DSC personnel.

In the future, this will provide BLM with a tool which can be used to collect resource utilization data such as the number of terminal users, amount of memory used, CPU utilization, telecommunications utilization, usage by user name or identification, and disk I/O activity.

AMS has reviewed CPE data for the DSC Level 6. Since the functions performed by the DSC are markedly different than those performed in the State Offices, (i.e. DSC primarily develops software and the State Offices run production applications) the utilization statistics from the DSC machine are not representative of 'typical' State Office Level 6 usage.

As a result of the limited CPE data available, a questionnaire was developed by the AMS project team which was then used to obtain estimates of Level 6 utilization. This questionnaire was used during telephone interviews with the personnel in charge of the State Office Level 6's. These persons are working with the Level 6's on a daily basis and were felt to be the best current source of utilization estimates.

The following summarizes the results of these interviews. These results, although based on estimates, are considered valid for strategic planning efforts.

- Approximately 90% of the systems were used only during prime shift;

- Most of the machines were utilized more than 60% during prime shift;

- Most systems have "adequate" disk space, although several are constrained.
- Many States are planning to implement additional applications

4.7 Data General and Hewlett Packard Systems Workload

Data General and Hewlett-Packard systems are used to support GIS applications in the DSC and State Offices. The Denver Service Center GIS systems are used primarily for the development and testing of GIS application software and data image analysis. For example, the Hewlett Packard system at DSC is dedicated to remote sensing digitized image analysis. The State Office systems, unlike the DSC, are primarily used in the production mode.

Only four States could provide statistics on their Data General systems. The results varied too widely to provide a basis for extrapolating the workload of other States. For example, CPU utilization ranged from 7.5% in California to 59% in Colorado with no detail on application mix or CPU usage. Also, the largest Data General systems were among those without statistics.

There is no computer generated or operationally maintained workload data currently available for the Hewlett Packard systems and most of the Data General systems. The GIS personnel interviewed estimated that the DSC systems are used to their capacity limit, and provided the following estimates of usage:

- 50% software development and maintenance;
- 30% resource application development;
- 13% database construction; and
- 7% miscellaneous

The DSC GIS personnel also provided estimates of the distribution of processing workloads by application area for a typical location. These estimates are:

- 75% of the usage is for production applications;

- 20% of the usage is for database construction; and
- 5% of the usage is for training.

DSC GIS personnel also provided estimates of relative CPU utilization for those State systems they were familiar with. These estimates are:

- Wyoming, New Mexico, and Colorado systems are heavily utilized;
- Oregon and California have medium utilization; and
- Idaho and Utah systems are lightly utilized.

Heavy utilization is defined as over 75%, medium utilization 50%, and light utilization as 25%.

Estimates of the total disk storage were also provided by DSC GIS personnel. They estimated the current BLM-wide GIS disk storage used as approximately 10 to 12 billion characters. Future storage projections were estimated to be approximately 5 to 15 billion characters per State (120 billion characters BLM-wide).

4.8 Burroughs B-4800 and B-2700 (Alaska) Workload

Burroughs B-4800 and B-2700 systems are currently installed in the Alaska State Office. These systems are in addition to the equipment typically found in other State Offices. The systems are available for use 24 hours per day, 7 days per week.

CPU utilization data provided by the Alaska State Office is shown in Figures 4-15 and 4-16. This data indicates that the CPU utilization of the B-4800 is approximately 20% while that of the B-2700 is approximately 40%. Alaska personnel also indicated that the disk space utilization is at 100%.

Figure 4-15. Processor utilization of the Alaska Burroughs B4800 averaged 20%.

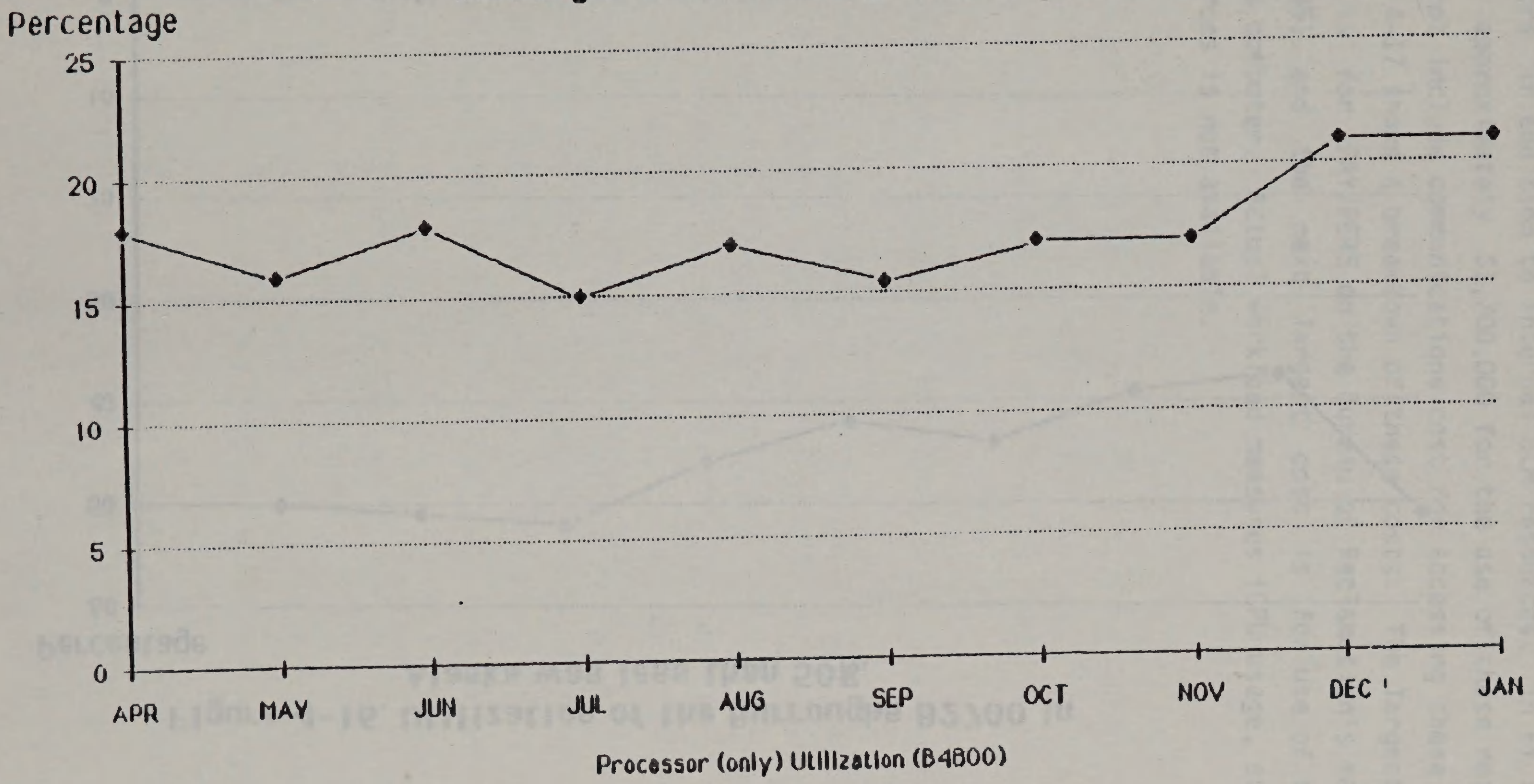
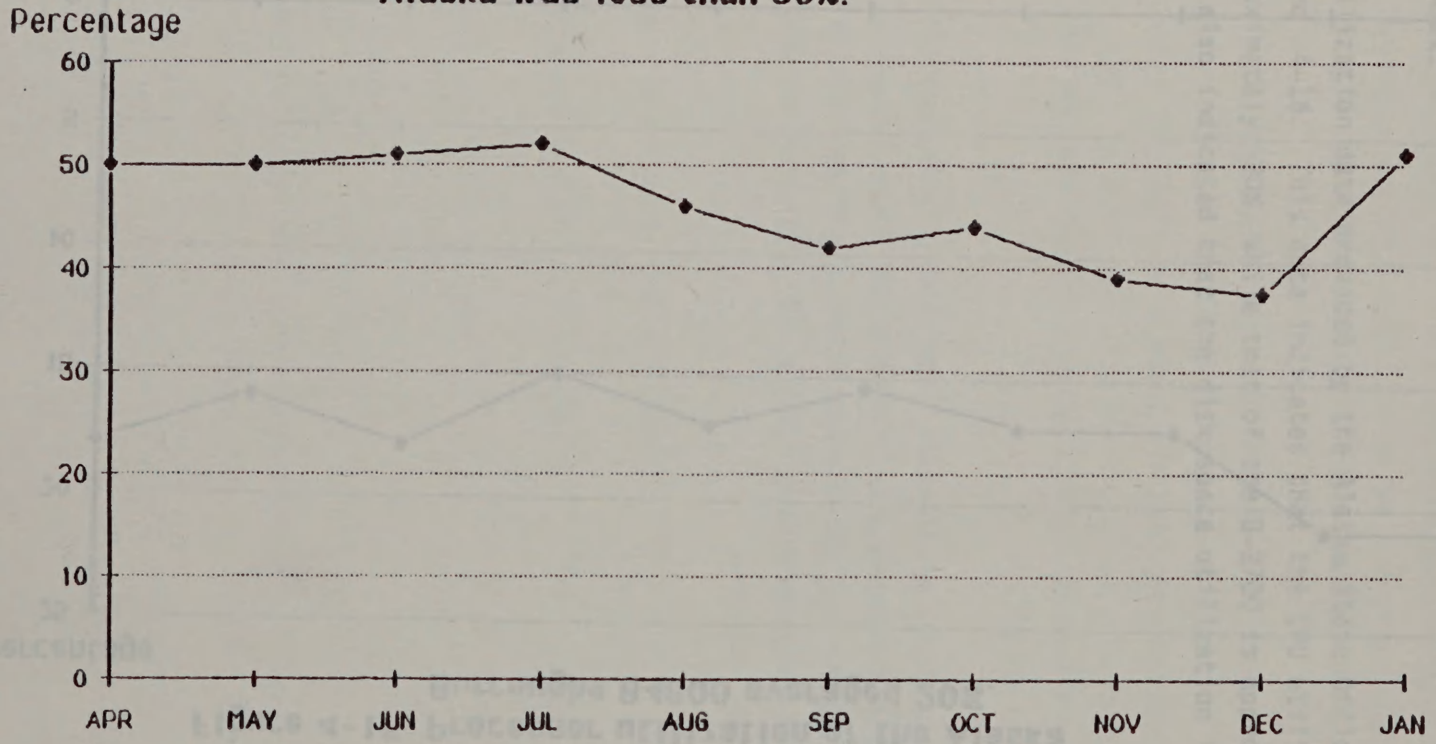


Figure 4-16. Utilization of the Burroughs B2700 in Alaska was less than 50%.



Processor (only) Utilization (B2700)

4.9 Outside Services Workload

As discussed in Chapter 3, BLM uses the ADP resources of outside agencies and vendors in addition to internal BLM resources. In FY 1985 BLM spent a total of approximately $1,700,000 for the use of these resources. This figure does not include communications cost for accessing these outside services. Figure 4-17 shows a breakdown of these costs. The largest use of outside resources is for PAY/PERS on the Bureau of Reclamation's mainframe ($1,060,000 in FY85) and the next largest cost is for use of the U.S. Geological Services computer. Actual workload measures (CPU usage, etc.) for these outside resources is not available.

Figure 4-17. FY'85 Costs for Outside ADP Services
(in $000)

	FWS	BIA	BOR	USDA	USGS *	BPA	Lib. of Congress	BM	EPA	Total
Alaska										0.0
Arizona				.4						.4
BIFC	21	53								74.0
California					7.7					7.7
Colorado				1	95.1					96.1
DSC			1059	12			48			1119.0
ESO					9.4					9.4
Idaho										0.0
Montana				13	33.3					46.3
New Mexico					112.0					112.0
Nevada				9.5	1.9					11.4
Oregon				17.1		60.9				78.0
Utah				1	16.3					17.3
WO					.2			2.5	1.6	4.3
Wyoming				8	102.3					110.3
TOTAL	21	53	1060	62	378.4	60.9	48	2.5	1.6	$ 1686.2

* includes MS-1, SLIMS, and miscellaneous small applications

4.10 Telecommunications Workload

The Honeywell portion of the BLM intersite data telecommunications networks is composed of dedicated 14.4 Kb or 9600 baud lines between DSC and each State Office and networks for each State connecting the State Offices and their respective District Offices and Resource Areas.

Within each site (DSC, State Offices, WO, etc.) a variety of networks are in place. Each State designs, constructs and operates their own network to meet their own specific needs.

A separate BLM intersite network is dedicated to the Fire Program. This network serves many of the same locations as the other BLM networks but it is completely distinct. There is no interaction between the Fire network and the other BLM networks, even when they serve the same location.

4.10.1 Available Telecommunications Workload Data

Currently there is no complete collection of telecommunications workload information. The main source of the telecommunications workload data we analyzed is a 1983-1984 report compiled by the DSC. This report, supplied by BLM summarizes the results of monitoring of the communications lines connecting DSC to the State Offices for 5 days (a very small sample size). This data may not be representative of BLM's DPS-8/70 total communications usage. The report does not address the communication links from the State Offices to their respective District Offices and Resource Areas or intrasite communications. The conclusions contained in this limited report were:

- The DSC to State Office lines are not heavily used;
- Planned applications (i.e., MS-1, DPP 10, and ALMRS) have a potentially large impact on BLM's total telecommunications requirements;
- Increased use of PC's and graphics terminals will substantially increase the telecommunications workload;

- The number of computer system ports connecting State Offices to the DPS-8/70 may cause future problems. State Office configuration changes can partially relieve the port connection problem;

- Most synchronous (HDLC) traffic between DSC and the State Offices is file transfers;

SARA-H reports the total number of TTY characters transmitted and received by the DPS-8/70 by time period for TSS only. There is, however, no identification of the location(s) transmitting or receiving these characters.

The CPE software recently installed on the Level 6's will provide detailed telecommunications workload data for the Level 6 systems. There are no workload statistics for the intra-state communications networks available until this data is collected.

4.10.2 Analysis of Telecommunications Workload

The telecommunications report addressed: Level 6 - DPS-8/70 (HDLC) communications traffic, asynchronous communications traffic, and multiplexor port utilization.

4.10.2.1 Level 6 to DPS-8 Communications Traffic

The HDLC links to the Honeywell Level 6 systems in the State Offices were mainly used to transfer files (approximately a three to one ratio of file to file transfers to other link usage for batch and remote concentration).

- Average daily traffic from the State Offices to the DSC was approximately 400,000 characters. Maximum average daily traffic was approximately 1,092,000 characters;

- Average daily traffic from the DSC to the State Offices was approximately 1,830,000 characters. Maximum average daily traffic was approximately 4,500,000 characters.

4.10.2.2 Asychronous Communications Traffic

The average daily line utilization for the State links ranged from less than 1% to 16% with Wyoming having the highest usage of an average of 120 characters transmitted per second. A sampling of snapshots showed that maximum utilization for 12 minutes was 28%. The average daily State Office to DSC multiplexor traffic ranged from 4,000 to 3,460,000 characters. The average daily DSC internal mux traffic is 7,364,000 characters.

4.10.2.3 Multiplexor Port Utilization

The data gathered on multiplexor port utilization describes the number of different ports active during a given day, not necessarily the number of ports active at any given time. The multiplexor port statistical data indicated no State used all available ports during the 5 day sample period. Although the data showed Colorado as the only State which is approaching accessing all its available ports, (Colorado used 16 of its 18 available ports) no conclusion indicating a saturation point is being approached.

APPENDIX A

DETAILED INVENTORY OF BLM SYSTEMS

A.1 Overview

An analysis of BLM's ADP and telecommunications equipment would be less than meaningful without an understanding of the location of that equipment. Appendix A describes BLM's ADP and telecommunications equipment by location, discusses the findings from an analysis of this equipment inventory by type of equipment, and includes a detailed listings of the equipment inventories for each BLM location.

Inventory in BLM is dynamic; over $6,500,000 has been approved for ADP/telecommunications purchases for FY87. The inventories presented in this document are dated 3/86 and are the versions of inventory received by AMS from each state by that date.

The Appendix consists of:

A.2 - ADP Inventory at DSC
A.3 - ADP Equipment Inventory for the Field Offices
A.4 - Central Processing Units
A.5 - Disk Drives and Storage
A.6 - Tape Drives
A.7 - Terminals and Teletypes
A.8 - Personal Computers
A.9 - Printers Plotters, Digitizers and Other Peripherals
A.10 - Detailed Equipment Inventories

A.2 ADP Inventory at the Denver Service Center

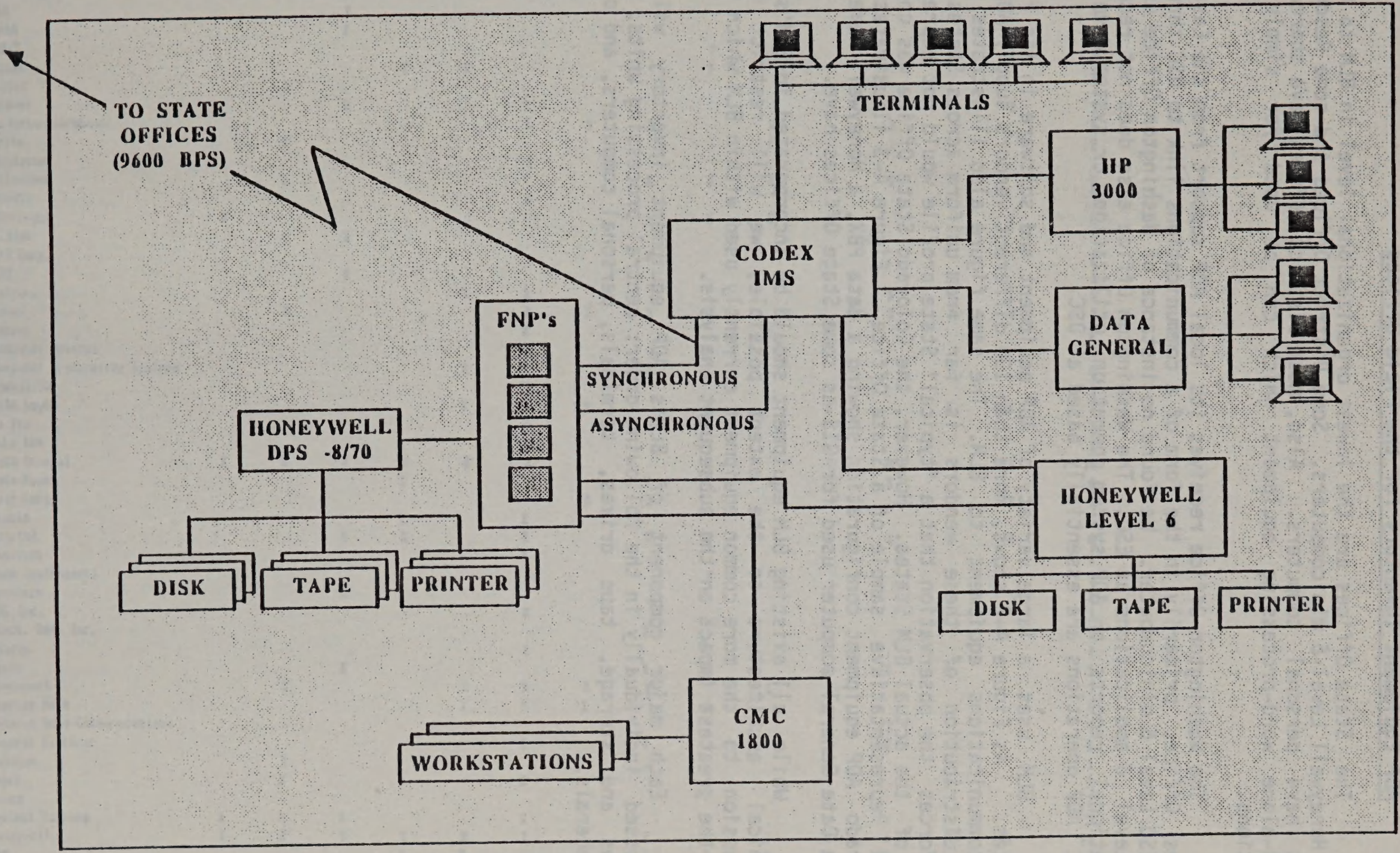
BLM's Denver Service Center (DSC) contains the largest concentration of ADP resources in the Bureau. In all, DSC operates seven major computer system configurations (as illustrated in Figure A-1):

- **A Honeywell DPS-8/70 mainframe** -- operated by the Division of Computer Operations and used to support BLM-wide application systems and for general ADP timesharing.
- **A Honeywell Level 6 minicomputer** -- also operated by the Division of Computer Operations and used to develop software for BLM's State Offices.
- **A Data General Eclipse C-330 and a Hewlitt-Packard 3000 with an array processor** -- operated by the Division of Advanced Data Technology for the development of BLM's Geographical Information System and data image analysis.
- **A Sperry-Univac CMC 1800** -- operated by the Division of Computer Operations to provide data entry services for the DPS-8.
- **A Data General minicomputer** -- used to support the Bureau's forms printing and distribution center in the Division of Administrative Systems.
- **A Dec Vax II** -- used to support ALMRS development.
- **A Hewlett Packard 9000/320** -- used to support ALMRS development.

The computer systems and peripherals at the Denver Service Center are connected together through a series of local linkages. First, many of the terminals at DSC are tied to the Intelligent Matrix Switch (IMS), a communications device that povides access to the DPS-8/70, Level 6, Eclipse C-330, Hewlitt-Packard 9000, and Data General. The IMS also provides the potential for communications between computers. Second, the DPS-8 and Level 6 are tied directly to each other by Honeywell's General Remote Terminal Supervisor telecommunications package; GRTS provides for terminal concentration, file transfer, and batch remote job entry input and output. In general, this means that any terminal directly connected to the Level 6 (i.e., one that does not use the IMS) can still access the DPS-8.

Externally, the DPS-8 is linked to the Level 6 minicomputers in each of BLM's twelve State Offices and the Boise Interagency Fire Center.

Figure A-1. Overview of Denver Service Center ADP Network



A.3 ADP Equipment Inventory for the Field Offices

The State Offices are the lowest organizational level in BLM to have the Honeywell Level 6 minicomputers. Some District Offices and some Resource Areas have personal computers. Also, most District Offices have shared or stand-alone word-processing equipment which can be used for simple ADP functions.

The Washington Office receives its local ADP support from the Eastern States Office, primarily in the form of a communications link to DSC through the ESO Level 6 minicomputer. We found no instance of Washington Office usage of Level 6 applications at ESO. The Washington Office also does not receive operational reports on ADP system operation, utilization, or system development. ADP operations are essentially based at DSC.

BLM uses a large variety of ADP equipment and software in its field offices. As Figure A-2 shows, more than 130 different vendors supply ADP or telecommunications equipment to BLM. The same figure also illustrates that the distribution of these vendors is far from uniform across States and reinforces the observation that a "typical" State profile would not represent any of the actual BLM States. However, the Colorado State Office was chosen as a representatiave sample of a State Office. Figure A-3 illustrates the Colorado ADP equipment configuration showing a data PBX, a Honeywell Level 6, and a Data General computer used for GIS as some State Offices have.

While all existing BLM equipment should be incorporated in BLM's new technical architecture to the extent possible, we will restrict this discussion to the more common equipment currently used within BLM which will have the greatest impact on the subsequent analysis.

Each major component of BLM's ADP equipment inventory will be discussed individually in the following order: central processing units, disk drives and storage, tape drives, terminals, personal computers, and other peripherals.

Figure A-2. BLM uses 130 ADP and telecommunications vendors

Vendor	ALASKA	ARIZONA	DIFC	CALIF.	COLO.	DSC	ESO	IDAHO	MONT.	NEVADA	NEW MEX.	OREGON	UTAH	WYOMING	OCCURENCES
3M			X												1
AIDS			X											X	2
AT&T									X	X					2
Altek				X	X				X						3
Altos		X													1
Anadex			X			X								X	3
Anderson-Jacobson						X	X	X		X		X	X		6
Apple		X								X					2
Applicon						X									1
Atlanthus		X						X	X	X		X			5
Bendix						X									1
Burroughs	X							X	X	X	X			X	6
C. Itoh			X												1
CPS Corp.								X							1
CPT			X												1
Calcomp					X	X						X	X	X	5
Codex		X				X	X	X	X			X	X	X	8
Compaq						X				X	X				3
Computer Devices						X									1
Computer Transceiver Systems					X	X		X					X		4
Comtal/3M						X									1
DATA South					X	X	X		X		X		X	X	7
Da Pro								X							1
Data 100						X									1
Data General	X	X	X	X	X	X			X		X	X		X	10
Data Point				X				X		X		X			4
Dest Corp.							X	X						X	3
Diablo				X		X									2
Digital			X	X		X		X	X		X	X	X	X	9
Digitech						X									1
Dunn Instruments						X			X						2
Dynatech			X												1
ESL Inc.						X									1
Elect. Dev. Inc.								X							1
Epicom						X									1
Epson			X					X			X	X	X		5
Execuport		X			X	X	X	X		X	X				7
Florida DATA					X	X	X		X						4
General Data Communications												X			1
General Electric						X		X		X		X			4
Halcyon		X						X			X				3
Hayes		X				X							X		3
Henco											X				1
Hewlett Packard	X	X	X			X						X			5
Honeywell	X	X	X	X	X	X	X	X	X	X	X	X	X	X	14
IBM				X	X	X	X	X	X	X	X	X	X	X	11
Int. Data Sci. Inc.							X	X					X		3
International Imaging Systems						X							X		2
Intertec				X	X			X				X	X	X	6
K & E						X									1
KAYPRO		X				X						X			3
KYBE						X									1
Kennedy						X									1

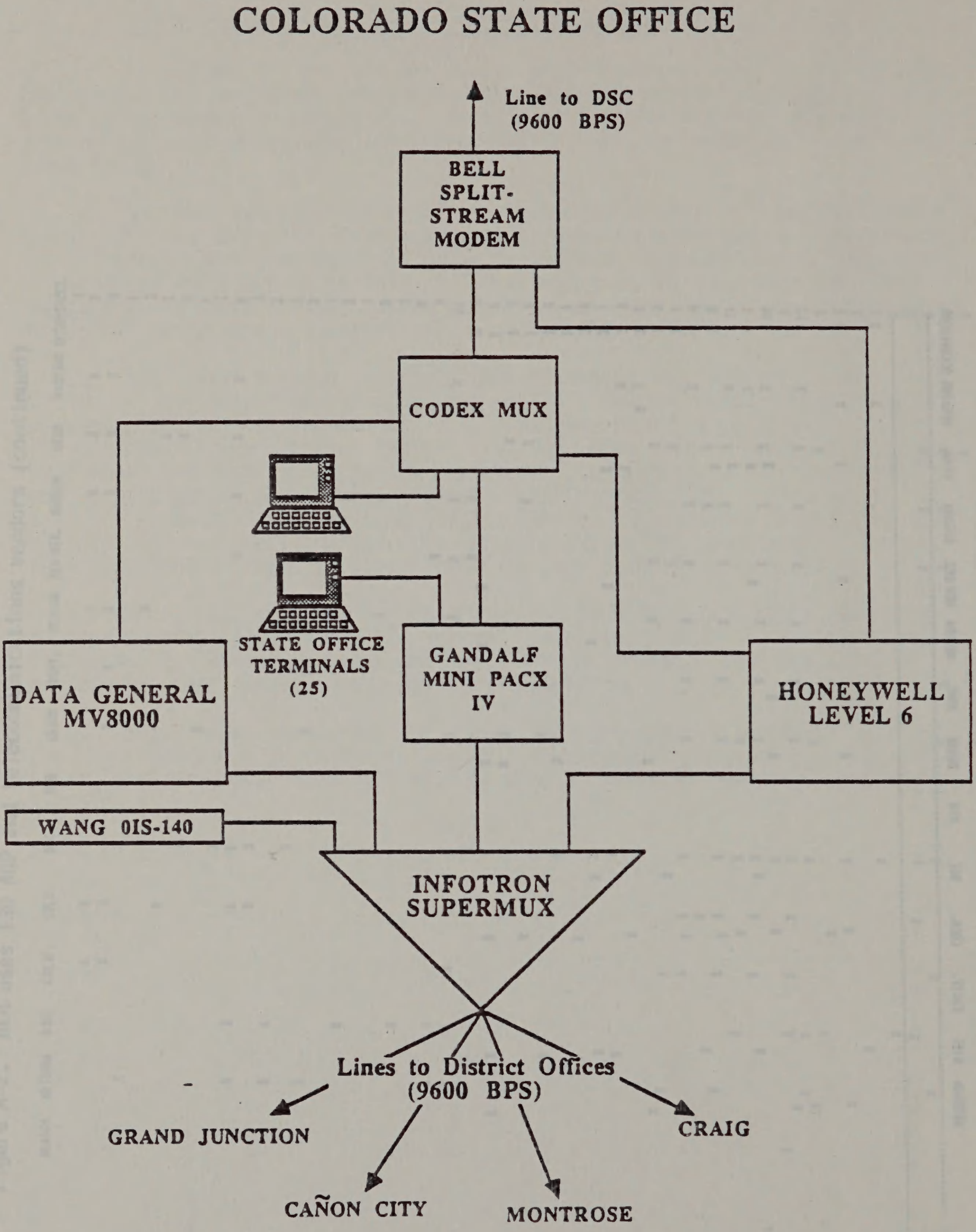
Figure A-2. BLM uses 130 ADP and telecommunications vendors (continued)

Vendor	ALASKA	ARIZONA	BIEC	CALIF.	COLO.	DSC	ESO	IDAHO	MONT.	NEVADA	NEW MEX.	OREGON	UTAH	WYOMING	OCCURENCES
Leading Edge						X									1
Lear Siegler				X	X	X				X		X	X	X	7
Mannesmann Tally				X	X	X		X	X	X		X	X	X	9
Megatek		X													1
Micom						X				X					2
Microbec					X								X		2
Modcomp						X							X		2
Monroe								X							1
Moore						X									1
Nicolet/Zeta		X	X		X	X					X	X	X	X	8
Northern Telecom					X	X									2
Northstar		X	X												2
OCLC						X			X						2
Okidata		X						X	X						3
Omnidata												X			1
Osborne			X			X						X			3
Penril												X			1
Philips										X		X			2
Qume			X												1
Racal-Vadic															0
Radio Shack		X	X								X	X			4
Ramtek/Omron		X	X	X	X	X		X	X	X	X	X		X	11
Rixon						X					X	X			3
SOROC TECH Inc.						X									1
Science Acc.								X					X		2
Sikes												X	X		2
Sola								X							1
Spectral Data Corp.						X									1
Sperry-Univac						X									1
Star Micronics						X									1
Summa Graphics						X								X	2
System Ind.														X	1
T-bar Inc.										X	X		X		3
Talos		X		X							X		X		4
Tandberg				X	X	X		X	X	X	X	X		X	9
Techtran Industries					X							X	X		3
Tektronix		X		X	X	X		X	X	X	X	X	X	X	11
Teletype			X			X		X						X	4
Televideo				X	X	X		X	X	X	X	X	X	X	10
Telex Computer Products						X									1
Texas Intruments	X		X	X	X	X		X	X	X	X	X	X	X	12
Topaz		X	X			X		X					X		5
Toshiba			X												1
Trendata						X									1
U.S. Robotics												X			1
Uarco						X									1
Versalite			X												1
Visual			X		X	X					X	X	X		6
Wang		X		X		X		X	X		X	X	X	X	9
Western Telemetric													X		1
Wright Line								X							1
Xerox						X		X							2

Figure A-2. BLM uses 130 ADP and telecommunications vendors (continued)

Vendor	ARIZONA	BIFC	CALIF.	COLO.	DSC	ESO	IDAHO	MONT.	NEVADA	NEW MEX.	OREGON	UTAH	WYOMING	OCCURENCES
Telecommunications														
Bell													X	1
Cermetek		X												1
Codex	X			X			X	X		X		X	X	7
Concord Data				X										1
Digilog	X													1
Equinox	X													1
Gandalf Data				X			X	X				X		4
Hayes		X			X					X		X		4
Infotron Systems				X								X		2
Jacobson				X								X		2
Microcom		X												1
Multi Tech				X										1
Omnimux					X									1
Paradyne	X						X						X	3
Penril				X								X		2
Racal-Milgo		X								X		X		3
Racal/Vadic		X			X				X					3
Radio Shack				X										1
Ram							X							1
Synergetics Intl.		X												1
TAC				X										1
UDS							X							1
Ventel	X	X		X			X		X	X		X	X	8

Figure A-3. Colorado utilizes a Codes Multiplexor and a Gandalf PBX to support its network



A.4 Central Processing Units (CPUs)

In the State Offices, BLM operates ADP systems primarily provided by five major manufacturers. Over 20 different CPU product lines, however, are installed as illustrated by Figure A-4. BLM buys CPU resources from outside services as well. This complex mix of equipment complicates the process of providing adequate systems software, ADP staff, supporting peripherals and supplies, and telecommunications to help the users properly utilize the CPUs. As Figure A-5 illustrates for Honeywell and Data General, the systems software operating on each CPU also varies by State. Each manufacturer's equipment will be discussed individually.

For most of the BLM computers, we have provided MIPS (millions of instructions per second) ratings for the CPUs. Although the MIPS rating of a CPU is commonly used as a measure of relative processing power it is not a universal measure of processor speed. MIPS comparisons are only precise for machines using the same instruction set such as models within one product line of a vendor. Internal design can cause one CPU to accomplish with a single instruction what another may accomplish in ten instructions.

- **Data General (DG)** - Data General CPUs are used for Geographic Information Systems and for fire fighting support. BLM uses eight different models of DG CPUs in five States, DSC and BIFC. The most common CPU is the M-600 Eclipse, which is used in two States and DSC for GIS applications. BLM has three models of virtual machines from DG, the MV10000, MV8000, and the MV4000. Virtual machines are CPUs with advanced internal addressing structures which allow for more efficient use of internal CPU memory, particularly among multiple users. The MV8000 is in Colorado; the others are at BIFC and in Alaska. The virtual machines use the AOS/VS operating system. All other models use the AOS operating system. The specific system utilities provided vary by location. The MV10000, located in BIFC to support the fire fighting program and in Alaska for GIS, is the biggest and most powerful of the DG CPU's in BLM with approximately 2.7 MIPS processing speed.

- **Burroughs** - Four models of Burroughs CPUs were listed in the inventories of three State Offices. The Alaska State Office uses a B2700, a mid-size minicomputer and a B4800, a larger midrange minicomputer, to run components of the AALRS land recordation system. New Mexico uses a B3185 for the State Fund Control and Accounting System. Wyoming and Montana use a small B94 minicomputer for receipt validation and processing.

- **Hewlett-Packard (HP)** - A HP3000 is located in DSC for image analysis as part of the Remote Sensing support for GIS. It operates under the MPE-V operating system.

  A HP9836 and a HP9845 are located in BIFC to support the fire detection and management software for IAMS. The third HP CPU, an HP1000, is dedicated to the micrographics processing being conducted in Wyoming. In Oregon, six HP9020s are used to run

Figure A-4. BLM operates over 20 different CPU product lines.

CPUs	AK	AZ	BIFC	CA	CO	DSC	ESO	ID	MT	NV	NM	OR	UT	WY
Honeywell Level 6 (43)	1													
Honeywell Level 6 (47)					1			1	1		1			
Honeywell Level 6 (57)	1					1			2					1
Level 6 - No Model		2*	1	1			1			1		1	1	
Data General														
MV 10000	1		1					1						
MV 8000					1									
MV 4000			2											
M/600 Eclipse						1					1			1
S//20														
9350														
C 150														
C330														
Hewlett-Packard														
9836			1											
9845			1									1		
3000					1									
1000														1
9020												6		
9000	1					1								
1220	1													
1236	1													
Burroughs														
B3185											1			
B2700	1													
B4800	1													
B-94									1					1
L99 38-200								1						1
DEC Vax II						1								
Osborne 1 (257747)						1								
Sperry 1800						1								
Spectral Data						1								

*Includes CPU for Phoenix Training Center

Figure A-5. The systems software used on each CPU varies by State Office.

System Software	ALASKA	ARIZONA	BIFC	CALIF.	COLO.	DSC	ESO	IDAHO	MONT.	NEVADA	NEW MEX.	OREGON	UTAH	WYOMING	D.C.
HONEYWELL LEVEL-6															
2780/3780 WKSTN FACILITY	X	X				X	X		X		X				
ADV. ASSEMBLER	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
ADV. COBOL	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
ADV. FORTRAN		X		X	X	X		X	X	X				X	
BASIC INTERPRETER/COMPILER	X	X		X		X				X					
BSC TRANSPORT FACILITY	X	X				X	X		X		X				
COMM. AND FILE TRANSFER FAC.	X					X	X								
DATA ENTRY FACILITY (DEF-II)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
DM6 TRANSACTION PROCESSOR						X									
GCOS-6, MOD 400, REL 3.2	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
INFO-6	X	X			X	X			X				X	X	
OAS DOCUMENT PROCESSING		X				X		X							
OAS RECORDS PROCESSING		X				X		X							
PRODUCTION FACILITY (UPF)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
RNP-6 WITH LHDLC, REF, ETC..	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
SORT/MERGE	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
TPS6 SCREENWRITER		X				X									
TPS6 TRANSACTION PROCESSING		X				X									
Data General															
AOS/VS OPERATING SYSTEM			X	X							X	X		X	
ASSEMBLER											X			X	
BASIC			X	X							X				
COBOL				X							X	X			
CSP												X			
FORTRAN			X	X	X						X	X		X	
GCI - GRAPHICS TERMINAL EMULATOR			X												
HASP				X											
IBM RJE EMULATOR					X						X				
IDEA												X			
INFOS II			X		X							X			
PASCAL			X												
RJE80															
RPGII				X											
SCREENWRITER											X				
SORT/MERGE			X	X	X						X	X		X	
USER PRODUCTION FACILITY											X				
Burroughs															
COBOL											X				
OPERATING SYSTEM											X				
SCREENWRITER											X				
SORT/MERGE											X				

sophisticated forest modeling software provided by the Forest Service. The HP9000 series all use the HP UX operating system. The HP1000 uses the HP RTE operating system.

A.5 Disk Drives and Storage

State Offices and BIFC use permanent and removable disk packs to store data, system software, and applications software. The disk drives on which these disk packs are mounted determine the on-line disk capacity of the BLM ADP systems.

As Figure A-6 illustrates, the States over 20 models of disk drives to support their data storage requirements. All but one disk drive model are from the same vendor as the CPU they support. This is not unusually high given that BLM has five CPU manufacturers and differences in drive models may be slight. For example, a Honeywell MSU 9104 is a Honeywell MSS 9104 without a disk controller; it would usually be a slave disk controlled by an MSS 9104 master. Seventy-four drives were identified with a total on-line capacity of approximately 16,600 Megabytes (Mb). The New Mexico State Office reported the most drives (9) and Nevada State Office reported the fewest (2).

The States use five different disk drive models, to support the Honeywell Level 6s. Over half are Honeywell MSS 9104s or MSU 9104s. Each 9104 provides 256Mb of data storage capacity. Each location listed at least one MSS 9104 or MSU 9104. Most State Offices listed two 9104s. The remaining drives supporting the Level 6s are Honeywell CDS 9116 or CDU 9116 Cartridge Tape drives which use smaller 10Mb cartridges for data storage. As with the 9104s, the CDS 9116 has a controller and the CDU 9116 does not. Ten of the 12 State Offices and BIFC listed a CDU or CDS 9116.

For Data General, the State Offices use five Data General models for 24 drives, and two System Industries 9751 disk drives. The most common model is the DG 6061, which provides 192Mb of storage capacity. The DG 6236 drive is used by the Colorado and New Mexico State Offices. It provides 354Mb of storage. In addition to the DG 6061, the Wyoming State Office uses a DG 6122 with 277Mb.

For the Burrough's B-94 CPU in the Wyoming State Office, one Burrough's B9493-20 disk drive provides 20Mb of data storage capacity. In the New Mexico State Office, a Burrough's B7318 drive supports their B3185 CPU. Alaska has the largest bank of Burrough's disk drives with four B9494 drives (207Mb each) and one B9484 drive (206Mb).

Figure A-6. BLM uses about 20 models of disk drives in the State Offices.

Manufacturer Models	AK	AZ	BIFC	CA	CO	DSC	ESO	ID	MT	NV	NM	OR	UT	WY	TOTAL
DATA GENERAL															
No model								1							1
6061 - 192 M				3	2	4					3	3		1	16
6122 - 277 M														1	1
6236 - 354 M					1						2				3
6237 -1062 M			1												1
6160 -73 M			1												1
HONEYWELL															
MSU 501						5									5
MSU 451						44									44
CDS 9116 - 10 MB Cartridge with Controller	1	1		1	1		1		1			1	1		8
CDU 9116 - 10 MB Cartridge with Disk			2					2						1	5
MSS 9104 - Disk Drive with Controller (256M)	1	2	1	1		3	1	3	1		2	1	1		17
MSU 9104 - Disk Drive w/o Controller (256M)	1	2		2	1		1		2	2	1	1	1	2	16
MSS 9100					1										1
MSU 9619 - with Controller			1												1
HEWLETT PACKARD															
7905						1									1
7914						2									2
7925						6									6
TEKTRONICS 4907														1	1
WANG 6565														1	1
XEROX						1									1
SPERRY UNIVAC CMC 1225						2									2
DIABLO 31						2									2
System Ind. 9751 Disk Drive														2	2
BURROUGHS															
B9493-20 Disk Drive														1	1
B7318 Disk Drive											1				1
B9494 - 207 M	4														4
B9484 - 206 M	1														1

A.6 Tape Drives

Magnetic tape technology improvements have increased tape densities and the number of tracks available on a tape to improve data storage capacity on magnetic tape. The higher the (BPI) bytes per inch and the number of tracks on the tape the more data a tape drive can store. The tape drives used must be designed to read specific tape densities and number of tracks. Nine-track technology is still widely used. Seven-track technology became obsolete over ten years ago. Current technology for nine-track tape is 6250 BPI. State of the art technology provides tape cartridges with 15,000 BPI and over 30 tracks.

As Figure A-7 illustrates, BLM's State Offices are supported by 11 vendors for approximately 64 tape drives overall. Of these, about half are nine-track, dual density tape drives which can read 800 BPI or 1600 BPI tapes. Three are nine-track 800 BPI drives. Three more are older seven-track 800 BPI drives. Some tape drives had insufficient information to determine their precise characteristics although their model numbers indicated they were most likely older models. DSC had the greatest variety, supporting drives from nine different vendors. The following is a breakdown by major vendor.

Eight of the 13 tape drives used for the Data General are Data General model 6026s; one is a model 4307H; and one is a model 6023 which is nine-track - 800 BPI, and one is a 1600/6250. Two are 6021 9 track 800 BPI drives. All of the locations using DG equipment have at least one tape drive which could use nine-track, 800 BPI tape.

For Burroughs equipment, Alaska State Office has installed four B9495 nine-track tape drives with a B9499 tape controller. The Wyoming and New Mexico State Offices did not report any tape drive support for their Burroughs equipment.

Figure A-7. Most of BLM's tape drives are nine-track, dual density drives.

Manufacturer Models	AK	AZ	BIFC	CA	CO	DSC	ESO	ID	MT	NV	NM	OR	UT	WY	TOTAL
Data 100-8202						2									2
DATA GENERAL															
6021 Tape Drive - 9 Track 800 BPI						1									2
6026 Tape Drive - 9 Track 800/1600 BPI			2	1	2	1					1			1	8
4307H Tape Drive			1												1
6023 Tape Drive - 9 Track 800 BPI				1											1
1600/6250 Tape Drive														1	1
HONEYWELL															
No model												2			2
9 Track MTU 9109 - 9 Track 800/1600BPI	2	1	1	2	2		2	2	2		2		1	2	19
MTC 9102 - Mag. Tape Cont. & Device Pac	1	1		1			1						1		5
7 Track MTU 9101 - Mag. Tape Controller										2					2
7 Track MTU 912 - 7 Track Tape Drive		1													1
MTC 9101		1													1
MTU 503						8									8
BURROUGHS															
B9495 - 9 Track 800/1600 BPI	4														4
HEWLETT PACKARD															
7970 - E						1									1
7970 - B						1									1
DEC VAX II															
Cartridge						1									1
MONROE - 39 2RW								1							1
WANG 6529														1	1
SPERRY UNIVAC TP13160						1									1
NORTHERN TELECOM SERIES 70						1									1
KENNEDY - 9800						1									1

A.7 Terminals and Teletypes

As Figure A-8 illustrates, the State Offices and DSC have 70 terminal and teletype models, 45 of which are present in at least one State Office. Of these 45 models, nineteen exist in only one of the State Offices. Of the 12 State Offices and BIFC, nine locations have a terminal model which does not exist at any other BLM location. Figure A-9 illustrates the distribution of terminals based on the number of locations in which a terminal model was listed. None of the 70 models exist in more than 12 locations. Over three-fourths of the terminal models occur in less than four locations.

One result of this proliferation of terminals is the problem of using and providing training for specific terminal types. Terminal keyboards are often different both in functions available and in the location of keys used to invoke terminal functions. Users must be trained to find the correct keys. Support staff must also be trained to learn the specifics of each terminal type. Unfortunately, this knowledge also has minimal transferrability to other locations since their compliment of terminals (and other equipment) is likely to be different. Therefore, any physical transfer of staff involves retraining.

A significant portion of the application software at DSC also depends on specific terminal characteristics to provide some terminal functions to the user. Since not all terminals support this functionality, the efforts of the DSC support staff are diluted by each incompatible terminal. BLM modifies the application software to support each new type of terminal. To avoid wasting scarce staff time, these modifications are not done for every unique terminal model. As a result, only specific terminals models can be used to run specific applications. Also, telecommunications protocols for specific hardware vendors are often simulated by off-brand terminal manufacturers but not exactly duplicated so that unusual and seemingly unpredictable communication failures occur.

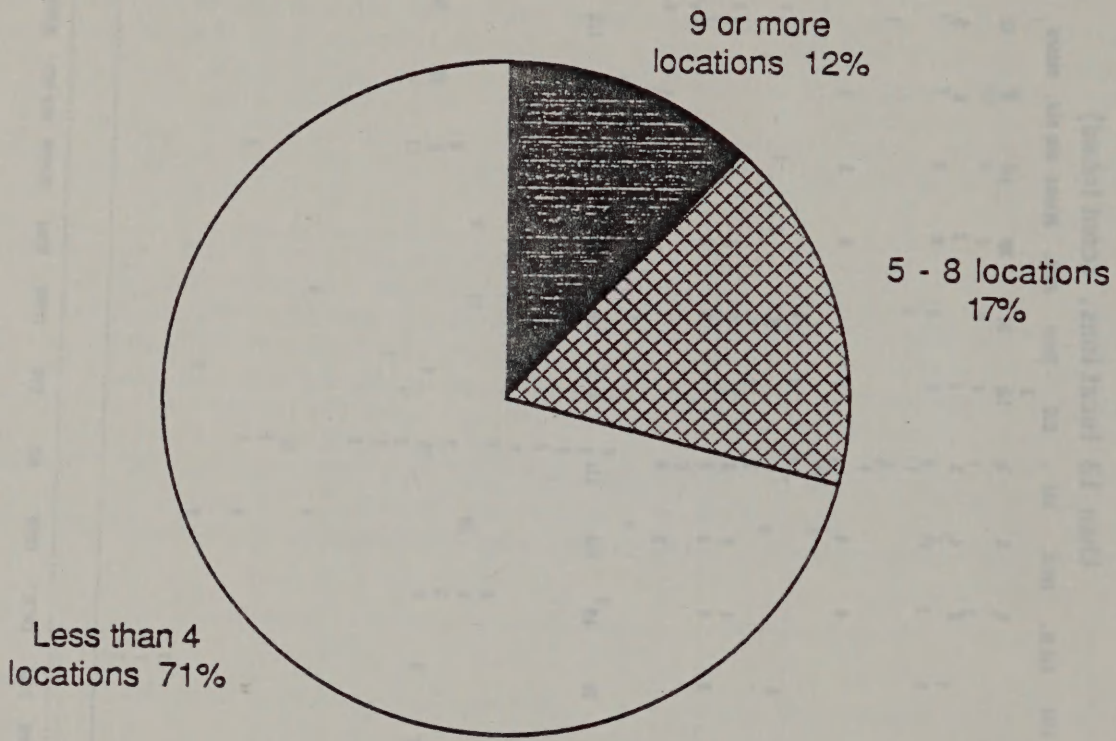
Figure A-8. BLM has 70 terminal models; none in more than 12 locations.

TERMINALS AND PERIPHERALS	ALASKA	ARIZONA	BIFC	CALIF.	COLO.	DSC	ESO	IDAHO	MONT.	NEVADA	NEW MEX.	OREGON	UTAH	WYOMING	TOTALS	OCCURENCES
Terminals																
ADS Viewpoint			5											3	8	2
Amdek			1												1	1
Anadex			2												2	1
Beehive Micro-B					1		1						1	2	5	4
Burroughs MT985														4	4	1
CTS 3600					3	2				6					11	3
CTS 3250						1									1	1
CTS 3810						18							3		21	2
CTS 4000					4			1					3		8	3
Codex 47850													1		1	1
Computer Devices						1									1	1
Cuatal Workstation						1									1	1
DEC LA-100						1				12				5	18	3
DEC LA-120		16	3	1		22	4			5	21	26		17	115	9
DEC LA-36				2		2				8					12	3
DEC T1220				7	23			12	8				15		65	5
DEC T300				1		1							5		7	3
DEC VT100						1									1	1
Data 100						1									1	1
Data General 6040						1									1	1
Data General 6051						1	1								2	2
Data General 6053				6		6					9			1	22	4
Data General D200					4									1	5	2
Data General D410												8			8	1
Data General Dasher												4		2	6	2
Data General VIS500										2					2	1
Datapoint												1			1	1
Execuport							1								1	1
General Electric					6				3	1		1			11	4
HP 2392A						1	3								4	2
HP 2621					1									1	2	2
HP 35741A						4	2								6	2
Honeywell (misc.)	114														114	1
Honeywell 7811						7									7	1
Honeywell VIP 7201								5							5	1
Honeywell VIP 7205			1	4	12	8	4	3	8	8	6	4	5	5	68	12
Honeywell VIP 7305	6		1		7		4		2						14	5
Honeywell VIP 7801				5		1	4	2	8	4	15		2	12	53	9
Honeywell VIP 7813	20	60		6		9	2		4	3	26		9	2	121	10
IBM 3178												1			1	1
Int'l Imaging Systems Workstation						1									1	1
Lear Siegler ADM-22													1		1	1
Lear Siegler ADM-3					2	8				7				3	20	4
Lear Siegler ADM-42		1													1	1
Lear Siegler ADM-5				1								1	1	1	4	4
Lear Siegler V-203													5		5	1
Northern Telecom					1										1	1
Ocle						2			1						3	2
Qaron 8025		1		11	9	13	1	4	4	6	5	23	9	7	93	12
Kamtel 8130			1		14	[illegible]	3	7	2				1		30	7
Soroc			2												3	2

Figure A-8. BLM has 70 terminal models; none in more than 12 locations. (continued)

TERMINALS AND PERIPHERALS	ALASKA	ARIZONA	BIFL	CALIF.	COLO.	DSC	ESO	IDAHO	MONT.	NEVADA	NEW MEX.	OREGON	UTAH	WYOMING	TOTALS	OCCURENCES
Superbrain							2								2	1
Tandberg TDV 2205				9	5	2	12	24	30	14	2	42	15	29	184	11
Tektronix 4010 (G)								1							1	1
Tektronix 4014-4 (G)				2	4	5					6	5	1	3	26	7
Tektronix 4016-1 (G)					2								1	2	5	3
Tektronix 4017						1									1	1
Tektronix 4025						1						1			2	2
Tektronix 4052						1									1	1
Tektronix 4054 (G)		1		4	4				4	1	1			6	21	7
Tektronix 4106						1									1	1
Tektronix 4114 (G)								1						1	2	2
Teletype TTY43			1			1		1						7	10	4
Televideo 920						3									3	1
Televideo 950				4	4	5	2	2	5	1		1	5	20	49	10
Texas Instruments	1		3	5	2	6		4	1			7	2		30	9
Trendata 4000						1									1	1
Visual 110					2	8					1		1		12	4
Xerox								1							1	1
Totals	141	79	20	68	110	151	45	68	80	78	92	125	86	134	1250	213

Figure A-9. Seventy-one percent of BLM terminal models exist in less than four locations.



A.8 Personal Computers

The use of personal computers or microcomputers in BLM is increasing. In the State Office equipment inventories, over 400 microcomputers were included, representing 20 vendors. Recently the Philips microcomputer was awarded the BLM microcomputer contract and selected as the BLM standard. It is an IBM-compatible microcomputer and the 21st micro vendor. The Vendors and the distribution of their products in BLM are illustrated by Figure A-10. The most common microcomputer is the Wang PC with 155 machines. This is due partly to the ease at BLM of acquiring a Wang PC. They are acquired through the office automation equipment contract as a word-processing and microcomputing workstation. This is a common combination of equipment functions, in government and industry, and becoming more common as the distinction between office automation and computing continues to blurr.

BLM uses these 82 Philips PCs which are IBM look-alikes. MS-1 will be downloaded to the Philips from the USGS Multics in October, 1986.

There are 32 Northstar Advantage PCs in BIFC linked with a LAN configuration and used primarily for office automation functions. They are located at strategic Fire Centers.

Another common PC at BLM is the IBM PC-XT with 10 machines. It is liked due to the its processing power and the amount of software available for it. In particular, Minerals analytical programs are used on the IBM-XTs which cannot realistically run on the PCs. The PC is theoretically IBM-compatible but the specific software used by BLM in Minerals does not work on the PC.

Part of the proliferation of microcomputers in BLM and the continued demand for them can be explained by the low level of computer literacy in BLM. The concept of having personal computing power which does not need to be allocated, or shared, or logged onto (and for which no procedures or rules restricts use) is attractive. Demand for microcomputers in the field offices seems to be based to a large extent on this perception rather than a clear concept of microcomputer processing advantages over shared processing. In the field, AMS observed that the field staff did not seem to be aware of the data entry, design, coding, testing, and maintenance activities that even simple PC applications would require. There was a lack of familiarity with the activities necessary to construct and operate effective automated systems. Many applications planned for BLM microcomputers could just as easily reside on a shared minicomputer if such resources were easily accessed and readily available.

Figure A-10. More than 20 microcomputer vendors were listed by the State Offices.

VENDORS	AK	AZ	BIFC	CA	CO	DSC	ESO	ID	MT	NV	NM	OR	UT	WY
Apple		2	3								2			
AT & T					1									
Beehive									1					6
Burroughs Micro								1	1					1
Compaq				1				3			2			
Data General 10; 20; 30					1	9			3	2	1	2		3
DEC Rainbow						1						1		
Hewlett Packard	3													
IBM														
PC				3		2	3							
XT				4	1	1	2				2		1	5
PC JR											3			
Intertec Superbrain				4	2		3	1			5	4	1	1
Kaypro		2				1	1					2		
Northstar			32											
Osborne			3											
Philips		20		15	15			2			8	15	7	
Sango					1									
Tandy 100											2			
TRS-80												21		
Tektronics		1		4					3				3	
Versalite			1											
Victor						1								
WANG PC		8		27		2	3	12	14	9	5	62	11	2
WANG 2200						1		1			11			

A.9 Printers, Plotters, Digitizers, and Other Peripherals

As Figure A-11 illustrates, peripherals within the State Offices have proliferated in the same way as terminals. Seventy-six models of printers, plotters, digitizers, and other peripherals were listed on the State Office and DSC inventories. About 50 of these models were represented in the State Offices alone. As Figure A-11, shows, 43 of these models occurred in only one BLM location. Of the 12 State Offices and BIFC, 33 locations had unique equipment models not listed by any other BLM site. The number of peripherals and peripheral models ranged from 12 peripherals and 10 models in the Arizona State Office to 116 peripherals encompassing 13 models in the Oregon State Office.

These models are not unique pieces of equipment, just unique models or vendors. For example, 30 different models of printers, eight models of digitizers, and six models of plotters were listed.

Multiple models of similar or equivalent peripherals create support and supply problems. Support staff must be trained in the day-to-day maintenance of each model of peripheral and supplies stocks for each must be ordered and maintained separately. They also increase the likelihood of obsolescence.

Figure A-11. BLM operates over 75 models of peripherals.

TERMINALS AND PERIPHERALS	ALASKA	ARIZONA	BIFC	CALIF.	COLO.	BSC	ESO	IDAHO	MONT.	NEVADA	NEW MEX.	OREGON	UTAH	WYOMING	TOTALS	OCCURENCES
Peripherals																
A.M. Varityper Photocomposer													1		1	1
AlanThus Disk Unit												1			1	1
Altek Digitizer				1	1				1				1	3	7	5
Altek Tape Unit									1						1	1
Anadex Printer			1			3			3					3	10	4
Anderson/Jacobsen Input Console								1							1	1
Applicon Plotter						1									1	1
Burroughs Printer	2							1			1				2	3
C.Itoh Printer			4												4	1
CTS Printer						1									1	1
Calcomp Digitizer		1	1		2	2								6	12	5
Calcomp Plotter		1	1		1	4						7		4	18	6
Compuscan OCR												1			1	1
DEC Letterwriter 100			1												1	1
DEC Printer						2							1		3	2
Data 100 Digitizer						1									1	1
Data General Printer											1				1	1
Data General Tape Drive											1				1	1
Data South Printer					1	4			4		2		2	10	23	6
Data Tech Graphics Processor						1									1	1
Diablo Printer				1		1									2	2
ESL Array Processor						1									1	1
Eaton Printer													5		5	1
Enter Graphics Printer						1									1	1
Epson Printer			8				2	1	1			4	4		20	6
Florida Data Printer					2	1							1	1	5	4
GE Printer						1		1							2	2
HP Digitizer		1				1									2	2
HP Plotter						1						2			3	2
HP Printer	5					1									1	2
Hei Card Reader	4		1												1	2
Hiatachi HDD 3648						1									1	1
Honeywell Mag-Tape Unit	3	1					2								3	3
Honeywell Printer	73		6			2	3		3	2	2		2		20	8
IBM Card Punch					1										1	1
KEE Digitizer						1									1	1
Leading Edge Printer I						4									4	1
Megatek Graphics System		3													3	1
Micro Peripheral Printer									1						1	1
Monroe Calculator								2							2	1
Monroe Printer								1							1	1
Munroe Tape Unit								1							1	1
Moore Decollator						1			1				1		3	3
NES Springwriter 7710							1								1	1
Nicolet Zeta Plotter		1	1	1	1	1			1	1	1	1	1	1	11	11
Nicolet Zeta Tape Controller		1							1						2	2
Northern Telecom Card Punch						1									1	1
Northern Telecom Printer						1									1	1
Northern Telecom RJE Unit						1									1	1
Northern Telecom Tape Drive					1	1									2	2
onics Graphics Calculator													17		17	
data Printer				8				1	1			5			15	

A-11. BLM operates over 75 models of peripherals. (continued)

TERMINALS AND PERIPHERALS	ALASKA	ARIZONA	BIFC	CALIF.	COLO.	DSC	ESO	IDAHO	MONT.	NEVADA	NEW MEX.	OREGON	UTAH	WYOMING	TOTALS	OCCURENCES
Omnidata Cassette reader									1				1		2	2
Omnidata Polycorder												53			53	1
Qume Printer			1										1		2	2
Racal-Milgo Printer			1												1	1
Rigs/Anadex Printer			1												1	1
Science Acc. Digitizer								1							1	1
Sibes Disk Unit												1			1	1
Star Micronics Printer						4									4	1
Stnd Register Burster													1		1	1
Summagraphics Digitizer Controller						1								1	2	2
Tally Mannesmann Printer				9	3	2	10	16	25	13		33	15	15	141	10
Talos Digitizer		1		2									1		4	3
Tektronics Hard Copier		1		3	10	5		2	3			3	2	8	37	9
Tektronix Graphic Input Device		1		2	1	1				1		3	1	1	11	8
Tektronix Graphics Systems													1		1	1
Tektronix Plotter				1		1				1		3	1		7	5
Teletype Printer			1												1	1
Telex Tape Drive						1									1	1
Texas Instrument Printer			2		13	4				1			2	2	24	6
Texas Instrument Printer/Plotter									2						2	1
Toshiba Printer			1												1	1
Uarco Burster						1									1	1
Versatec Plotter						1								1	2	2
Wang Printer								5			15				20	2
Totals	07	12	31	27	36	62	10	33	40	19	23	116	60	53	538	173

A.10 Detailed Equipment Inventories

The following pages contain detailed ADP equipment inventories for each BLM facility (in alphabetical order).

ALASKA DETAILED INVENTORY

OFFICE: Alaska State Office - Partial Inventory as of 3/86 (Data General not included)

MANUFACTURER	MODEL	ITEM DESCRIPTION	QUANTITY
BURROUGHS	2645VN	CIRCUIT-SYNC-2400	1
BURROUGHS	276-0446	CIRCUIT-SYNC-POLL-2400	1
BURROUGHS	276-0826	CIRCUIT-ASYNC-TTY-300	1
BURROUGHS	276-0834	CIRCUIT-ASYNC-TTY-300	1
BURROUGHS	276-0847	CIRCUIT-ASYNC-POLL-1200	1
BURROUGHS	276-3016	CIRCUIT-ASYNC-TTY-1200	1
BURROUGHS	276-3017	CIRCUIT-ASYNC-TTY-1200	1
BURROUGHS	276-4652	CIRCUIT-ASYNC-TTTY-300	1
BURROUGHS	276-4653	CIRCUIT-ASYNC-TTY-300	1
BURROUGHS	276-5788	CIRCUIT-SYNC-BSC-4800	1
BURROUGHS	276-8650	CIRCUIT-ASYNC-TTY-1200	1
BURROUGHS	276-8651	CIRCUIT-ASYNC-TTY-1200	1
BURROUGHS	3571VN	CIRCUIT-SYNC-2400	1
BURROUGHS	3572VN	CIRCUIT-SYNC-2400	1
BURROUGHS	3573VN	CIRCUIT-SYNC-2400	1
BURROUGHS	3574VN	CIRCUIT-SYNC-2400	1
BURROUGHS	3615VN	CIRCUIT-ASYNC-2400	1
BURROUGHS	4191VN	CIRCUIT-SYNC-2400	1
BURROUGHS	B1-4 IC	MEMORY	6
BURROUGHS	B4000	FORTRAN COMP	1
BURROUGHS	B4000-FLM	FLAME	1
BURROUGHS	B4096-8	I/O CABINET	1
BURROUGHS	B4099-8	FLOATING PT.	1
BURROUGHS	B4100-9	IC MEMORY	1
BURROUGHS	B4246-81	PRT. CONTROL	1
BURROUGHS	B4303-8	B874 DLP	1
BURROUGHS	B4304-8	DLP DISK PK	4
BURROUGHS	B4342-8	CONSOLE	1
BURROUGHS	B4395-82	MTU DLP	2
BURROUGHS	B4885	CPU SYSTEM	1
BURROUGHS	B551-1	DIRECT CONECT DUAL ADAPTOR	1
BURROUGHS	B551-6	DATA SET CON	9
BURROUGHS	B74-1	MEM. EXPANSION	1
BURROUGHS	B874	NET DEF LANG	1
BURROUGHS	B874-4	SYST & COMM CTL	1
BURROUGHS	B9115	CARD READER	1
BURROUGHS	B9246-15	PRINTER	1
BURROUGHS	B9246-20	PRINTER	1
BURROUGHS	B9387-47	DISK CONTLR	1
BURROUGHS	B9484-51	206 DISK PK	1
BURROUGHS	B9494-44	207 DISK DRV'S	1
BURROUGHS	B9495-3	TAPE DRIVE	4
BURROUGHS	B9499-14	TAPE EXCHGE	1
BURROUGHS	B999-2	NRZ OPTION	4
BURROUGHS	DIRECT	CIRCUIT-ASYNC-9600	1
BURROUGHS	MC7 B4000	MESS CNTL	1
BURROUGHS	SRI	EDITOR	1
HEWLETT PACKARD	(36") 7585B	PLOTTERS	1
HEWLETT PACKARD	-------	MODEL (ACCESS DG)	1
HEWLETT PACKARD	1220	CPU	1
HEWLETT PACKARD	1236	CPU	1
HEWLETT PACKARD	2631B	PRINTER	3
HEWLETT PACKARD	2932A	PRINTER	1

OFFICE: Alaska State Office - Partial Inventory as of 3/86 (Data General not included)

MANUFACTURER	MODEL	ITEM DESCRIPTION	QUANTITY
HEWLETT PACKARD	7470A (9 X 11)	PLOTTERS	1
HEWLETT PACKARD	7580A	PLOTTERS	2
HEWLETT PACKARD	7580B	PLOTTERS	1
HEWLETT PACKARD	82901M	FLEXIBLE DISK DRIVE	3
HEWLETT PACKARD	85 SERIES	MICROCOMPUTERS	3
HEWLETT PACKARD	9000 SERIES	CPU	1
HEWLETT PACKARD	9134	HARD DISK WINCHESTERS	2
HONEYWELL		TERMINAL RMTOO	1
HONEYWELL		TERMINAL GENOO	1
HONEYWELL	---	PRINTER - ASO OIL & GAS	4
HONEYWELL	---	PRINTER - ASO DEAN CRABBS	1
HONEYWELL	0000	TERMINALS - ADO PUBLIC ROOM	1
HONEYWELL	0174	PRINTER - ASO ANCSA - BRISTOL	1
HONEYWELL	0175	PRINTER ASO T & LS	1
HONEYWELL	0176	PRINTER - ASO PUBLIC ROOM	1
HONEYWELL	0177	PRINTER - ASO STATE SELECTIONS	1
HONEYWELL	0178	PRINTER - ASO PUBLIC ROOM	2
HONEYWELL	0180	PRINTER	1
HONEYWELL	0182	PRINTER - ASO STATE SELECTIONS	1
HONEYWELL	0183	PRINTER - ADO PUBLIC ROOM	3
HONEYWELL	0184	PRINTER - ASO PUBLIC ROOM	1
HONEYWELL	0185	PRINTER - ASO DOCKET ROOM	1
HONEYWELL	0186	PRINTER - FDO ADJUDICATION	1
HONEYWELL	0187	PRINTER - ASO L&MO (OIL & GAS)	1
HONEYWELL	0188	PRINTER - ASO STATE SELECTIONS	1
HONEYWELL	0191	PRINTER - ASO PUBLIC ROOM	1
HONEYWELL	0194	PRINTER - FDO PUBLIC ROOM	1
HONEYWELL	0305	PRINTER - FDO ARCTIC - KOBUK RA	1
HONEYWELL	0391	PRINTER - ASO OIL & GAS	1
HONEYWELL	0509	TERMINALS - FDO ADJUDICATION	1
HONEYWELL	0510	TERMINALS - ASO ANCSA - SEA AK	1
HONEYWELL	0511	TERMINALS - ASO OIL & GAS	1
HONEYWELL	0512	TERMINALS ADP OPERATIONS	1
HONEYWELL	0513	TERMINALS - FDO DOCKET	1
HONEYWELL	0514	TERMINALS - ASO DEAN CRABBS	1
HONEYWELL	0514	TERMINALS - ADP OPERATIONS	1
HONEYWELL	0515	TERMINALS - ASO OIL & GAS	1
HONEYWELL	0516	TERMINALS - ASO STATE SELECTIONS	1
HONEYWELL	0519	TERMINALS	1
HONEYWELL	0522	TERMINALS - FDO PUBLIC ROOM	1
HONEYWELL	0524	PRINTER - FDO DOCKET	1
HONEYWELL	0524	TERMINALS - FDO PUBLIC ROOM	1
HONEYWELL	0527	ASO NATIVE ALOTMENT	1
HONEYWELL	0529	TERMINALS - ASO PUBLIC ROOM	1
HONEYWELL	0530	TERMINALS - ASO PHOTOGRAMMETRY	1
HONEYWELL	0533	TERMINALS - ASO DOCKET ROOM	1
HONEYWELL	0558	TERMINALS - ADP OPERATIONS	1
HONEYWELL	0562	PRINTER - ASO PUBLIC ROOM	1
HONEYWELL	0666	PRINTER - ADO PUB COUNTER	1
HONEYWELL	0684	PRINTER - ADP OPERATIONS	1
HONEYWELL	0685	PRINTER - ADP OPERATIONS	1
HONEYWELL	0687	PRINTER - ASO L&MO	1
HONEYWELL	0688	PRINTER - FDO SWITCH BOARD	1
HONEYWELL	0690	PRINTER - ASO STATE LANDS	1

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MANUFACTURER	MODEL	ITEM DESCRIPTION	QUANTITY
HONEYWELL	0692	FDO PUBLIC ROOM	1
HONEYWELL	0693	PRINTER - ADO PENINSULA RA	1
HONEYWELL	0694	PRINTER - ASO ANCSA - DOYON	1
HONEYWELL	0695	PRINTER - ASO L&MO	2
HONEYWELL	0697	PRINTER - ADO MCGRATH RA	1
HONEYWELL	0698	PRINTER - ASO ANCSA - SEA AK	1
HONEYWELL	0699	PRINTER ASO L&MO	1
HONEYWELL	0700	PRINTER - FDO ADJUDICATION	1
HONEYWELL	0701	PRINTER - ADP OPS A B SWTCH BOX	1
HONEYWELL	0701	ADP OPERATIONS	1
HONEYWELL	0702	PRINTER - ADP OPERATIONS	1
HONEYWELL	0703	PRINTER - FDO UKON RESOURCES	1
HONEYWELL	0705	PRINTER - ASO NATIVE ALOTMENT	1
HONEYWELL	0706	PRINTER - ASO ANCSA DOCKET	1
HONEYWELL	0707	PRINTER FDO FIRE LOGISTICS	1
HONEYWELL	0708	PRINTER - ASO CAD SURVEY	1
HONEYWELL	0788	PRINTER - ADP OPERATIONS	1
HONEYWELL	0789	PRINTER - FDO DOCKET	1
HONEYWELL	0791	PRINTER - ADP OPERATIONS	1
HONEYWELL	0792	PRINTER - ASO OIL & GAS	2
HONEYWELL	0793	PRINTER - ADO PUBLIC ROOM	1
HONEYWELL	0794	PRINTER - ASO PUBLIC ROOM	1
HONEYWELL	0795	PRINTER - ASO RESOURCES	2
HONEYWELL	0797	PRINTER - ADP OPERATIONS	1
HONEYWELL	0799	PRINTER - ASO PUBLIC ROOM	1
HONEYWELL	0802	PRINTER - ADP OPERATIONS	1
HONEYWELL	0804	PRINTER - ASO DOCKET ROOM	1
HONEYWELL	0826	TERMINALS	1
HONEYWELL	0844	TERMINAL ADP OPERATIONS	1
HONEYWELL	0850	PRINTER - ASO L&MO (OIL & GAS)	1
HONEYWELL	0850	TERMINALS - FDO DOCKET	1
HONEYWELL	0851	PRINTER - FDO PBULIC ROOM	1
HONEYWELL	0851	TERMINALS - ASO L&MO (OIL & GAS)	1
HONEYWELL	0852	TERMINALS - ADP OPERATIONS	1
HONEYWELL	0853	TERMINALS - ASO PUBLIC ROOM	1
HONEYWELL	0854	TERMINALS AD POPS A B SWTCH BOX	3
HONEYWELL	0855	TERMINALS - ASO CAD SURVEY	1
HONEYWELL	0857	TERMINALS - ADO MCGRATH RA	1
HONEYWELL	0858	TERMINALS - ASO PUBLIC ROOM	1
HONEYWELL	0859	TERMINALS - FDO ADJUDICATION	1
HONEYWELL	0860	TERMINALS - ADP OPERATIONS	1
HONEYWELL	0861	TERMINALS - ADP OPERATIONS	2
HONEYWELL	0862	TERMINALS - ASO ANCSA DOCKET	1
HONEYWELL	0862	TERMINALS - ASO L&MO	1
HONEYWELL	0864	TERMINALS - FDO RECORDS	1
HONEYWELL	0863	TERMINALS - ASO PUBLIC ROOM	1
HONEYWELL	0865	TERMINALS - ADO PENINSULA RA	1
HONEYWELL	0866	TERMINALS - FDO ARCTIC - KOBUK RA	1
HONEYWELL	0867	TERMINALS - ASO RESOURCES	1
HONEYWELL	0869	PRINTER - ASO L&MO	1
HONEYWELL	0869	TERMINALS	3
HONEYWELL	0872	TERMINALS - ASO STATE SELECTIONS	1
HONEYWELL	0873	TERMINALS - ASO STATE SELECTIONS	1
HONEYWELL	1991	TERMINALS - FDO SWITCH BOARD	1

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MANUFACTURER	MODEL	ITEM DESCRIPTION	QUANTITY
HONEYWELL	3016	TERMINALS - ASO L&MO	1
HONEYWELL	3017	TERMINALS - ASO OIL & GAS	2
HONEYWELL	3284	TERMINALS - 0788	1
HONEYWELL	3982	TERMINALS - FDO YUKON RESOURCES	1
HONEYWELL	3983	TERMINALS - ADO UPB COUNTER	1
HONEYWELL	3984	TERMINALS	2
HONEYWELL	3988	TERMINALS - ASO ANCSA - BRISTOL	1
HONEYWELL	3989	TERMINALS - ASO ANCSA - DOYON	1
HONEYWELL	3990	TERMINALS - ASP AMCSA - EASEMENTS	1
HONEYWELL	3991	TERMINALS - FDO FIRE LOGISTICS	1
HONEYWELL	3992	TERMINALS - ASO T & LS	1
HONEYWELL	3993	TERMINALS - ADO PUBLIC ROOM	1
HONEYWELL	3994	TERMINALS - ASO L&MO (OIL & GAS)	1
HONEYWELL	3995	TERMINALS - ASO OIL & GAS	1
HONEYWELL	3996	TERMINALS - ASO L&MO	2
HONEYWELL	3997	TERMINALS	2
HONEYWELL	3998	TERMINALS - FDO PUBLIC ROOM	1
HONEYWELL	4003	TERMINALS - ASO L&MO	1
HONEYWELL	69320	PRINTER - ADP OPERATIONS	1
HONEYWELL	7075	TERMINAL APRT1	1
HONEYWELL	7170	TERMINAL APRT3	10
HONEYWELL	7175	TERMINAL OPU01	1
HONEYWELL	7200	TERMINAL CONSOLE	2
HONEYWELL	7270	TERMINAL	1
HONEYWELL	7305	TERMINAL	6
HONEYWELL	7813	TERMINAL APROP	20
HONEYWELL	BLKBX	TERMINAL FITTY	1
HONEYWELL	CA89003	KIT LOWER FRONT DOOR	1
HONEYWELL	CA89003	HD BASIC CABINET	1
HONEYWELL	CA89003	KIT CABLE TROUGH	1
HONEYWELL	CA89003	80 INCH RACK - CABINET	1
HONEYWELL	CA89012	KIT TAPE DOOR	1
HONEYWELL	CA89012	60 INCH EXPANSION CABINET	1
HONEYWELL	CA89012	KIT HD MULTI CAB	2
HONEYWELL	CA89012	HD EXPANSION CAB	1
HONEYWELL	CA89037	60 INCH EXPANSION CABINET	1
HONEYWELL	CA89037	CABINET EXPANSION HD	1
HONEYWELL	CA89037	KIT FILLER PANEL 1.7	1
HONEYWELL	CA89037	KIT FILLER PANEL 5.2	1
HONEYWELL	CA89038	ATTACHMENT KIT CA89037 TO CA89003	1
HONEYWELL	CA89038	KIT HD MULTI CAB	1
HONEYWELL	CA89402	MEGABUSS EXPANSION CHASSIS, 9 SLCT	1
HONEYWELL	CA89402	KIT NML WRP TRAY	1
HONEYWELL	CA89402	TRAY EXPANSION 10 CARD	1
HONEYWELL	CA89402	KIT VENTED FRT PNL	1
HONEYWELL	CA89402	POWER SUPPLY M176 60HZ	1
HONEYWELL	CA89402	AC INPUT ASSY	1
HONEYWELL	CDM9101	CART DISK DEVICE PAK	1
HONEYWELL	CDM9101	NML DISK ADAPTER	2
HONEYWELL	CDS9116	CART DISK 60H 120V	1
HONEYWELL	CDS9116	CABLE 8 FT	1
HONEYWELL	CDS9116	KIT DISK INSTALLATION	1
HONEYWELL	CDS9116	CARTRIDGE DISK UNIT W-CONTROLLER	1
HONEYWELL	CDS9116	KIT STABILIZER FOOT	1

OFFICE: Alaska State Office - Partial Inventory as of 3/86 (Data General not included)

MANUFACTURER	MODEL	ITEM DESCRIPTION	QUANTITY
HONEYWELL	CMC9009	EXPANDED MEMORY	3
HONEYWELL	CMC9038	EXPANDED MEMORY	3
HONEYWELL	CMC9132	LEVEL 6 MEMORY DAUGHTER BOARTDS - 256KB	1
HONEYWELL	CMC9132	LEVEL 6 MEMORY CONTROLLER AND 512KB	1
HONEYWELL	CMC9654	MEM DTR 256KB	1
HONEYWELL	CMC9654	1MB MEMORY EXPANSION	1
HONEYWELL	CMC9654	MEM EXPANDED	1
HONEYWELL	CMM9006	LEVEL 6 32K PARITY MEMORY	4
HONEYWELL	CPF9519	LEVEL 6 MAX SLOW CIP	1
HONEYWELL	CPF9519	LEVEL 6 MOD-43 IO MOD-47 UPGRADE	1
HONEYWELL	CPK9657	LEVEL 6 MODEL 47 TO 57 UPGRADE CIP MOD 5X FAST	1
HONEYWELL	CPK9657	LEVEL 6 CBL L6 CACHE KIT	1
HONEYWELL	CPK9657	LEVEL 6 MMU 150 4X-5X	1
HONEYWELL	CPK9657	LEVEL 6 CPU 150 5X	1
HONEYWELL	CPK9657	LEVEL 6 C-R CACHE	1
HONEYWELL	CPS9561	LEVEL 6 MODEL 43 CPU 10 SLOT	1
HONEYWELL	CPS9561	LEVEL 6 DRESS PANEL	1
HONEYWELL	CPS9561	LEVEL 6 150 CONTROL PANEL	1
HONEYWELL	CPS9561	LEVEL 6 KIT NML WRP TRAY	1
HONEYWELL	CPS9561	LEVEL 6 10 CARD BASIC CHASSIS	1
HONEYWELL	CPS9561	LEVEL 6 KIT VENTED FRONT PANEL	1
HONEYWELL	CPS9561	LEVEL 6 KIT NML CONTROL PANEL	1
HONEYWELL	CPS9561	LEVEL 6 M170 POWER SUPPLY 60H	1
HONEYWELL	CPS9561	LEVEL 6 4X 150 RALU	1
HONEYWELL	CPS9561	LEVEL 6 M170 POWER SUPPLY 60H	1
HONEYWELL	CPS9561	LEVEL 6 4X 150 CPU	1
HONEYWELL	CPS9561	LEVEL 6 AC INPUT ASSY	1
HONEYWELL	CRM9101	LEVEL 6 CARD READER DEVICE PAC	1
HONEYWELL	CRM9101	LEVEL 6 BDC ADAPTER CARD READER	1
HONEYWELL	CRU9108	LEVEL 6 CARD READER	1
HONEYWELL	CRU9108	LEVEL 6 CABLE NML FOR CARD READER	1
HONEYWELL	DCE9606	LEVEL 6 LIU EXPANSION CHASIS	1
HONEYWELL	DCF9606	LEVEL 6 CHAS ASSY 16 LIU	1
HONEYWELL	DCF9606	LEVEL 6 CA PWR DTST 5V	1
HONEYWELL	DCF9606	LEVEL 6 CBL PWR SUP TO CON	1
HONEYWELL	DCF9606	LEVEL 6 CA PWR EXT 5V	1
HONEYWELL	DCF9606	LEVEL 6 CONN ASSY SHORTING	1
HONEYWELL	DCF9640	LEVEL 6 LIV ADAPTER	1
HONEYWELL	DCF9640	LEVEL 6 LIU RS232C-V.24	1
HONEYWELL	DCF9643	LEVEL 6 RS422 ASYNCHRONOUS LINE INTERFACE UNIT	1
HONEYWELL	DCF9643	LEVEL 6 RS-422 LIV LINE INTERFACE UNIT	1
HONEYWELL	DCF9661	LEVEL 6 AUTODIAL LINE INTERFACE UNIT FOR DCM9641	1
HONEYWELL	DCM9101	LEVEL 6 ASYNCHRONOUS COMMUNICATIONS PAK	1
HONEYWELL	DCM9101	LEVEL 6 CBL BLKHD SYNC-ASY	1
HONEYWELL	DCM9101	LEVEL 6 ASYNCHRONOUS COMMUNICATIONS PAK	1
HONEYWELL	DCM9101	LEVEL 6 MLCC ADAPT-2 LINES ASYNCH EIA	3
HONEYWELL	DCM9101	LEVEL 6 CBL COMM DATA	1
HONEYWELL	DCM9101	LEVEL 6 CBL HNP SYNC + ASYNC 30 FT	1
HONEYWELL	DCM9103	LEVEL 6 SYNCHRONOUS COMMUNICATION PROCESSOR	1
HONEYWELL	DCM9103	LEVEL 6 MLCC ADAPT - 2 LINES SYNCH EIA	1
HONEYWELL	DCM9103	LEVEL 6 CBL HNP SYNCH + ASYNC 30 FEET	1
HONEYWELL	DCM9106	LEVEL 6 CBL DATA SET LA	1
HONEYWELL	DCM9106	LEVEL 6 HDLC COMMUNICATIONS PAC	1
HONEYWELL	DCM9106	LEVEL 6 MLCC ADAPT - HDLC	1

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MANUFACTURER	MODEL	ITEM DESCRIPTION	QUANTITY
HONEYWELL	DCM9110	LEVEL 6 AUTO CALL DAUGHTER BOARD	1
HONEYWELL	DCM9110	LEVEL 6 DUAL AUTO CALL ADA	1
HONEYWELL	DCM9110	LEVEL 6 CA BH AUTOCALL	1
HONEYWELL	DCM9137	LEVEL 6 CA CONT-RH INT	1
HONEYWELL	DCM9137	LEVEL 6 RS-422 COMMUNICATIONS FAC	1
HONEYWELL	DCM9137	LEVEL 6 MLCC ADAPT ASYNC	1
HONEYWELL	DCM9137	LEVEL 6 ADAPTER PLATE	2
HONEYWELL	DCM9137	LEVEL 6 MLCC ADAPT ASYNC	1
HONEYWELL	DCM9137	LEVEL 6 TWO PORT RS-422 DAUGHTER BOARD	1
HONEYWELL	DCM9641	LEVEL 6 RS-232 DAUGHTER BOARD - 4 PORT	1
HONEYWELL	DCM9641	LEVEL 6 LIU BACKPLANE KIT	1
HONEYWELL	DCM9641	LEVEL 6 ADAPTER SYNC-ASYNC	1
HONEYWELL	DCM9641	LEVEL 6 4 LINE ASYNCHRONOUS ADAPTER FOR MLC9640	1
HONEYWELL	DCM9641	LEVEL 6 LIU BACKPLANE KIT	1
HONEYWELL	DCM9641	LEVEL 6 4 CHANNEL ASYNCH DAUGHTER BOARD	1
HONEYWELL	DCM9641	LEVEL 6 LIU BACKPLANE KIT	1
HONEYWELL	DCM9641	LEVEL 6 4 LINE ASYN-SYN COMM ADAPTER BOARD	1
HONEYWELL	DCM9641	LEVEL 6 LIU BACKPLANE KIT	1
HONEYWELL	DLU7813	LEVEL 6 DLU 7813 LOGIC BOARD	1
HONEYWELL	DLU7813	LEVEL 6 LOGIC BOARD	3
HONEYWELL	DMK7886	LEVEL 6 KEYBOARD MULTI-FUNCTION 7813-7305	11
HONEYWELL	DMU7300	LEVEL 6 CRU - DISPLAY MONITOR 12 IN	1
HONEYWELL	DMU7300	LEVEL 6 CRT 7300 MONITOR 12 IN GREEN	1
HONEYWELL	DMU7300	LEVEL 6 CRU - DISPLAY MONITOR 12 IN	1
HONEYWELL	DPU7300	LEVEL 6 CRU POWER 60H	2
HONEYWELL	DPU7300	LEVEL 6 CRU POWER SUPPLY	1
HONEYWELL	DPU7300	LEVEL 6 POWER CABLE	1
HONEYWELL	IN202	TERMINAL APRT2	1
HONEYWELL	IN202	TERMINAL FPRT4	1
HONEYWELL	KCM9101	LEVEL 6 KEYBOARD CONSOLE DEVICE PAC	1
HONEYWELL	KCM9101	LEVEL 6 BDC ADAPTER CONSOLE	1
HONEYWELL	M4190	LEVEL 6 256MB REMOVABLE DISK PACK	1
HONEYWELL	MDC9101	LEVEL 6 MULTIPLE DEVICE CONTROLLER	2
HONEYWELL	MLC9103	LEVEL 6 MULTILINE COMMUNICATIONS PROCESSOR	3
HONEYWELL	MLC9103	LEVEL 6 KIT COMM BLKHD	1
HONEYWELL	MLC9103	LEVEL 6 MLCP BASIC	1
HONEYWELL	MLC9640	LEVEL 6 MULTILINE COMMUNICATIONS PROCESSOR	1
HONEYWELL	MLC9640	LEVEL 6 MLC-16 CONT	1
HONEYWELL	MLC9640	LEVEL 6 MULTI-LINE COMM PROCESSOR - 16 PORTS	1
HONEYWELL	MSC9101	LEVEL 6 NML DISK CONT	1
HONEYWELL	MSC9101	LEVEL 6 MASS STORAGE CONTROLLER	1
HONEYWELL	MSS9104	LEVEL 6 256MB MASS STORAGE UNIT W-CONTROLLER	1
HONEYWELL	MSS9104	LEVEL 6 DISK DEVICE 60HZ	1
HONEYWELL	MSS9104	LEVEL 6 CBL RADI	1
HONEYWELL	MSS9104	LEVEL 6 SMD ADAP	1
HONEYWELL	MSS9104	LEVEL 6 CBL DAIS	2
HONEYWELL	MSS9104	LEVEL 6 MSC CNTL	1
HONEYWELL	MSS9104	LEVEL 6 CBL GROUND	1
HONEYWELL	MSS9104	LEVEL 6 MSU ADAP	1
HONEYWELL	MSS9104	LEVEL 6 TERMINAT	1
HONEYWELL	MSU9104	LEVEL 6 256MB MASS STORAGE UNIT W-O CONTROLLER	1
HONEYWELL	MSU9104	LEVEL 6 CBL GROUND	1
HONEYWELL	MSU9104	LEVEL 6 DISK DEVICE 60HZ	1
HONEYWELL	MTC9102	LEVEL 6 MAGNETIC TAPE CONTROLLER AND DEVICE PAC	1

OFFICE: Alaska State Office - Partial Inventory as of 3/86 (Data General not included)

MANUFACTURER	MODEL	ITEM DESCRIPTION	QUANTITY
HONEYWELL	MTC9102	LEVEL 6 CABLE 4 INCHES	1
HONEYWELL	MTC9102	LEVEL 6 PE MAG TAPE	1
HONEYWELL	MTC9102	LEVEL 6 CLOCK-ANALOG	2
HONEYWELL	MTC9102	LEVEL 6 DATA RECOVERY UNIT	1
HONEYWELL	MTC9102	LEVEL 6 CLOCK-ANALOG	1
HONEYWELL	MTC9102	LEVEL 6 ADAPTER	1
HONEYWELL	MTU9109	LEVEL 6 MAGNETIC TAPE DEVICE 9TRACK 45IPS	1
HONEYWELL	MTU9109	LEVEL 6 TAPE DRIVE 60H 120V	1
HONEYWELL	MTU9109	LEVEL 6 MAGNETIC TAPE DEVICE 9TRACK 45IPS	1
HONEYWELL	MTU9109	LEVEL 6 TAPE DRIVE 60H 120V	1
HONEYWELL	MTU9109	LEVEL 6 READ TERMINATOR	1
HONEYWELL	MTU9109	LEVEL 6 KIT TAPE DR EXP CA	1
HONEYWELL	MTU9109	LEVEL 6 CBL DEVICE TO DEVICE	1
HONEYWELL	MTU9109	LEVEL 6 CNTRL CABLE TO DEVICE	1
HONEYWELL	MTU9109	LEVEL 6 WRITE TERMINATOR	1
HONEYWELL	PRF9102	LEVEL 6 VERT FORMAT UNIT FOR 990 LPM PRINTER	1
HONEYWELL	PRF9102	LEVEL 6 TAPE PUNCH	1
HONEYWELL	PRF9102	LEVEL 6 12 CHANNEL VERT FORMAT TAPE	1
HONEYWELL	PRM9101	LEVEL 6 DEVICE PAC FOR PRINTER	2
HONEYWELL	PRM9101	LEVEL 6 BDC ADAPTER PRINTER	1
HONEYWELL	PRM9101	LEVEL 6 MDC ADAPT PRINTER	1
HONEYWELL	PRM9101	LEVEL 6 PRU9104 CABLE KIT	1
HONEYWELL	PRU7170	LEVEL 6 PRINTER 150 CPS RS-422 DIRECT CONNECT	4
HONEYWELL	PRU7170	LEVEL 6 PRINTER NML ASPI 32 PTR	3
HONEYWELL	PRU7270	LEVEL 6 PRINTER 400 CPS NML ASPI 38	1
HONEYWELL	PRU9104	LEVEL 6 LINE PRINTER 300 LPM	1
HONEYWELL	PRU9109	LEVEL 6 LINE PRINTER 990 LPM	1
HONEYWELL	PRU9109	LEVEL 6 PRINTER 301 WITH 120 VOLTS	1
HONEYWELL	PRU9109	LEVEL 6 CABLE KIT	1
HONEYWELL	PSS9004	LEVEL 6 CBL AC CORD 60H	1
HONEYWELL	PSS9004	LEVEL 6 POWER DIST UNIT 60H	1
HONEYWELL	PSS9004	LEVEL 6 CA PWH AC CORD	1
HONEYWELL	PSS9004	LEVEL 6 POWER DISTRIBUTION UNIT	2
HONEYWELL	TTY	TERMINAL TTY01	1
HONEYWELL	TWU9104	LEVEL 6 CONSOLE TYPEWRITER	1
HONEYWELL	TWU9104	LEVEL 6 CBL CONSOLE	1
HONEYWELL	VBK7305	LEVEL 6 VIP UPGRADE KIT 7301 TO 7305	1
HONEYWELL	VIP7205	LEVEL 6 CRT DISPLAY TERMINAL	1
HONEYWELL	VIP7301	LEVEL 6 KEYBOARD 7300 STANDARD USA	5
HONEYWELL	VIP7301	LEVEL 6 CRT-DISPLAY TERMINAL	1
HONEYWELL	VIP7301	LEVEL 6 PWA ASSY UNIT RS-422	5
HONEYWELL	VIP7301	LEVEL 6 POWER SUPPLY MODEL 60HZ	1
HONEYWELL	VIP7301	LEVEL 6 POWER SUPPLY MODEL 60HZ	1
HONEYWELL	VIP7301	LEVEL 6 TERMINALS	2
HONEYWELL	VIP7301	LEVEL 6 TERMINAL 60HZ 12 INCH GREEN	5
HONEYWELL	VIP7301	LEVEL 6 KIT SCREWDRIVER	1
HONEYWELL	VIP7301	LEVEL 6 CABLE ASSY POWER 60HZ	1
HONEYWELL	VIP7301	LEVEL 6 CABLE 25 FT CROSSOVER	1
HONEYWELL	VIP7813	LEVEL 6 CRT DISPLAY TERMINALS	1
HONEYWELL	VIP7813	LEVEL 6 KYHD MF 7813-7305	1
HONEYWELL	VIP7813	LEVEL 6 VIP 7813 TERMINAL - LOGIC UNIT	2
HONEYWELL	VIP7813	LEVEL 6 MF KEYB	1
HONEYWELL	VIP7813	LEVEL 6 KYHD MF 7813-7305	3
HONEYWELL	VIP7813	LEVEL 6 POWER SUPPLY	1

OFFICE: Alaska State Office - Partial Inventory as of 3/86 (Data General not included)

MANUFACTURER	MODEL	ITEM DESCRIPTION	QUANTITY
HONEYWELL	VIP7813	LEVEL 6 PWR SUP MDI 60HZ	4
HONEYWELL	VIP7813	LEVEL 6 MONITOR 7300 12 IN GREEN	1
HONEYWELL	VIP7813	LEVEL 6 PWA CRU 7813 422-2	4
HONEYWELL	VIP7813	LEVEL 6 TERM 60HZ 12IN GREEN	4
HONEYWELL	VIP7813	LEVEL 6 T2001 OVERLAY	1
HONEYWELL	VIP7813	LEVEL 6 KIT SCREWDRIVER	1
HONEYWELL	VIP7813	LEVEL 6 CABLE W16 25 FOOT	1
HONEYWELL	VIP7813	LEVEL 6 VIP 7813 TERMINAL	5
HONEYWELL	VIP7813	LEVEL 6 KYBD MF 7813-7305	1
HONEYWELL	VIP7813	LEVEL 6 KEYBOARD MULTI-FUNCTION	5
HONEYWELL	VIP7813	LEVEL 6 LOGIC BOARD	5
HONEYWELL	VIP7813	LEVEL 6 POWER SUPPLY	6
HONEYWELL	VIP7813	LEVEL 6 MONITOR 7300 12 IN GREEN	1
HONEYWELL	VIP7813	LEVEL 6 POWER CABLE FOR 7813	1
HONEYWELL	VIP7813	LEVEL 6 DATA CABLE FOR RS-422	1
HONEYWELL	XC04859	PRINTER - 0686	1
HONEYWELL	XC11396	PRINTER 0851	1
HONEYWELL	XC13239	MODEMS	1
HONEYWELL	XC13239	PRINTER - 0788	1
HONEYWELL	XCC11396	PRINTER 0795	1
TEXAS INSTRUMENTS	TI810	TERMINAL BARCD	1

ARIZONA DETAILED INVENTORY

OFFICE: Arizona State Office - Inventory as of 3/86

MANUFACTURER	MODEL	ITEM DESCRIPTION	QUANTITY
Apple	MacIntosh	Microcomputer	2
Alanthus	LA-120	Printer/Terminal	16
C. ITOH	1500	Printer	20
Codex	6005	Multiplexor	16
Codex	6000	Network Processor	1
Data General	C150	Minicomputer	1
Digilog	MSC-1200	Network Supv. System	1
Equinox	0036	Device	0
Equinox	0037	Device	0
Equinox	0033	Port-Contention	1
Halcyon	T9600	Modem	2
Honeywell	B300-101	300 LPM Band Printer	1
Honeywell	*	900 LPM Printer	1
Honeywell	SHL928	Assembler	1
Honeywell	SHL930	Basic	1
Honeywell	CR-500	Card Reader	1
Honeywell	SHL933	Co Compiler	1
Honeywell	SHL927	For Compiler	1
Honeywell	SHC922	GCOS 2780/3780	1
Honeywell	SHC909	GCOS BSC Transport	1
Honeywell	SHC949	GCOS Data Entry	1
Honeywell	SND908	GCOS Info	1
Honeywell	AHP040	GCOS OASF	1
Honeywell	SHF909	GCOS Sort/Merge	1
Honeywell	STS990	GCOS Transaction Processor	1
Honeywell	003	Mass Storage Units	4
Honeywell	L6	Minicomputer	2
Honeywell	SHL915	MOD400	2
Honeywell	7075	Printer	33
Honeywell	SHL964	Remote Network	1
Honeywell	*	Tape Drives 10,000	4
Honeywell	7813	Terminal	60
KayPro	*	Microcomputer	2
Lear Seigler	ADM3	Terminal	-
Lear Seigler	ADM24	Terminal	-
Megatek	5000	Graphic System	3
Nicholet/Zeta	C63	Controller	1
Nicholet/Zeta	3610	Plotter	1
Omron-Ramtek	8025	Terminal	1
Paradyne	T96	Modem	16
Philips	P3100	Microcomputer	20
Talso	*	Dig. Tablet	1
Tektronix	4954	Dig. Tablet	1
Tektronix	4907	File Manager	1
Tektronix	4054	Graphic Term	1
Tektronix	4611	Printer	1
Ven-Tel	212T	Modem	32
Wang	PC	Microcomputer	8

BIFC DETAILED INVENTORY

OFFICE: BIFC - Inventory as of 3/86

MANUFACTURER	MODEL	ITEM DESCRIPTION	QUANTITY
3M	EMT9165	Telecopier	2
Applied Digital Data System	*	Terminal ($1440.00 each)	5
Amdek	Color II	Monitor	1
Anadex	DP800	Floppy Disk Drives	2
Anadex	-	Printer	1
Anadex	*	Video Monitors	2
Apple	IIE	Microcomputer ($2200 each)	3
Apple	1200	Modem	1
C.Itoh	F-1055	Printer	4
CalComp	9000	Digitizer Tablet	1
Cermetek	1200	Modem	1
Cermetek	212A	Modem	2
CPT	8525	Word Processor	2
Data General	6241	6500 Color Display	1
Data General	6160	73 MB Disk and Cabinet	1
Data General	3905-78H	AOS/VS Basic Language	1
Data General	3901-75H	AOS/VS Fortran 77 Language	1
Data General	3901-70N	AOS/VS Fortran 77 STR Service	2
Data General	3913-10N	AOS/VS Infos II Querry Software	1
Data General	3900-75H	AOS/VS Operating for MV40000s	3
Data General	30051-76H	AOS/VS PASCAL Language	1
Data General	3915-10N	AOS/VS Sort/Merge Software	1
Data General	*	Asynchronous Controller IAC/16	12
Data General	4327A	Band Printer	1
Data General	6130	D400 CRT Terminal	2
Data General	6131	D400 Keyboard	2
Data General	EB762	Expansion Chassis	2
Data General	30220-01H	GCI for 6500 Graphic Terminal AOS/VS	1
Data General	8706	I/O Bus Repeater Board	2
Data General	3910-75H	Infos II System	1
Data General	5899KCA	MCS Cables	6
Data General	S/20	Minicomputer	1
Data General	MV10000	Minicomputer	1
Data General	6237	2062 MB Disk Storage System	1
Data General	4307H	Tape Drive	1
Data General	619M	Teleprinter	1
Data General	MV4000	Minicomputer	2
Data General	6160	73MB Disk Storage	2
Data General	4372CD	Mounts	2
Data General	8766	Power Booster Board	2
Data General	5899HR	Radial MCS Chassis	1
Data General	5899J	Radial MCS Interface Boards	3
Data General	5899I	Radial MCS Repeater Boards	3
Data General	3915-20H	Sort/Merge Repro Copy	1
Data General	6026	Tape Drive with Cabinet and Cables	2

OFFICE: BIFC - Inventory as of 3/86

MANUFACTURER	MODEL	ITEM DESCRIPTION	QUANTITY
Data General	619MA	TP2 Teleprinter	2
Digital	DecWtr II	Terminal/Printer	3
Dynatech	*	Peripheral Switch Matrix for 128 Channels	2
Dynatech/Scipar	*	Watchdog Microprocessor Unit for Dynatech above	2
Epson	MX100	Printer	1
Epson	MX80	Printer	3
Epson	LQ1500	Printer	1
Epson	FX-80	Printer ($65.00 each)	2
Hayes	1200	Modem ($400 each)	2
Hayes	1200	Modem ($500.each)	7
HEI	Model 3	Card Reader	1
HEI	Model 3	Operator Console	1
Hewlett Packard	9845	Microcomputer	1
Hewlett Packard	9836	Microcomputer - Includes: Printer and 2 disk drives	1
Honeywell	TWU9104	Console Typewriter	1
Honeywell	CDU9116	Disk Drive ($8400 each)	2
Honeywell	PRN9104	Line Printer ($10,400)	2
Honeywell	MSS9104	Mass Storage Unit	1
Honeywell	Level 6	Minicomputer	1
Honeywell	PRU7170	Serial Printer	3
Honeywell	PRU7070	Serial Printer	1
Honeywell	MTU9109	Tape Drive	1
Honeywell	VIP7201	Terminal	1
Honeywell	VIP7305	Terminal ($1950 each)	3
Honeywell	VIP7205	Terminal ($2250 each)	5
Kinemetrics	60 DC	Time Standard	1
Microcom	SX/1200	Modem	1
N/A	N/A	Dedicated Circuit	45
N/A	Voice-grade	Telecomm. Lines ($33.80/$35.40)	24
Nicolet-zeta	Z-8	Plotter	1
Northstar	Advantage 2Q	Microcomputer ($2339.00 each)	32
Northstar	Horizon	Microcomputer (10 MB)	1
Northstar	Advantage	Microcomputer, HD 15, ($5068.00 each)	4
Northstar	Advantage	Microcomputer, HD 30	1
Northstar	SOROC	Terminals	2
Osborne	Executive	Microcomputer ($1000.00 each)	3
Qume	Rotary VII	Printer	1
Racal-Milgo	1200 Mark II	Modem	55
Racal-Milgo	Omnimode 48	Modem	21
Racal-Milgo	Omnimode 96	Modem	11
Racal-Milgo	24LSI	Modem	2
Racal-Milgo	1200 Mark I	Modem	1
Racal-Milgo	Omnimux 160	Multiplexor	2
Racal-Milgo	Omnimux 80	Multiplexor ($57 each)	9
Racal-Milgo	CMS-185	Network Diagnostic Controller	1

OFFICE: BIFC - Inventory as of 3/86

MANUFACTURER	MODEL	ITEM DESCRIPTION	QUANTITY
Racal-Milgo	82A 5232	Printer (Leased)	1
Racal-Vadic	VA212LC	Modem	1
Radio Shack	TRS-80	Microcomputer	2
Ramtek	8130	Terminal - CRT	1
RIGS	*	Consists of a desktop microcomputer, display terminal and printer as follows: IAMS RIGS Remote Interactive Graphics System	25
RIGS/Anadex	DP9501	Printer ($1,616.00)	1
RIGS/Data General	8735NT	256 Kbyte memory expansion ($1,056.00)	1
RIGS/Data General	44632T	4 line asynchronous multiplexer ($925.00)	1
RIGS/Data General	*	AOS Operating System ($400.00)	1
RIGS/Data General	30577-80T	Basic Language ($300.00)	1
RIGS/Data General	20	Desktop Microcomputer ($6,979.00) Includes: 512KB memory, 368KB Floppy Disk Drive, 15MB Winchester Disk Drive	1
RIGS/Data General	30582-80T	Pascal Language ($800.00)	1
RIGS/Visual	500	Graphics Display ($2,424.00)	1
Scipar	*	Customized Appl. Software	2
Synergetics Intl.	1006B	GOES DCP Demodulator	5
Synergetics Intl.	1004B	GOES Receiver	1
Teletype	43	Printer	1
Texas Instruments	810	Printer	1
Texas Instruments	810 RO	Printer	1
Texas Instruments	765	Terminal	2
Texas Instruments	820KSR	Terminal - Hard Copy	1
Topaz	Model 2	Power Conditioner	1
Topaz	Source II	Standby Power System	1
Toshiba	WTZ2060R999	Printer	1
Ven-Tel	2100-31	Modem	1
Ven-Tel	MD212-3E	Modem	1
Ven-Tel	*	Modem	1
Ven-Tel	212+	Modem	1
Versalite ADDS	S4-1000	Microcomputer	1
Wang	DW/OS-55	Printer - Lease	1
Wang	6581WC-1	Printer-lease	1
Wang	OIS-50	Word Processor - Lease	1
Wang	OIS-40	Word Processor - Lease	1

CALIFORNIA DETAILED INVENTORY

OFFICE: California State Office - Inventory as of 3/86

MANUFACTURER	MODEL	ITEM DESCRIPTION	QUANTITY
ALTEK	*	Digitizing Tablet	1
Burroughs	PC	Microcomputers	4
Data General	6053	Display Terminal	6
Data General	C-330	Mass Storage Unit	2
Data General	C-330	Master Station Printer Terminal	6
Data General	C-330	Minicomputer	1
Data General	C-330	Printer	1
Data General	C-330	Tape Drive	2
Data Point	5500	Mass Storage Unit	4
Data Point	5500	Master Station Display Terminal	1
Data Point	5500	Minicomputer	1
Data Point	5500	Printer	1
Data Point	5500	Tape Drive	1
DEC	DS-120	Hard copy terminal	2
DEC	LA-1220	Hard copy terminal	7
DEC	T-300	Hard copy terminal	1
Diablo	630	R/O Printer	1
Honeywell	Level 6	Card Reader	1
Honeywell	VIP 7813	Display Terminal	6
Honeywell	VIP 7200	Display Terminal	1
Honeywell	VIP 7801	Display Terminal	5
Honeywell	VIP 7200	Display Terminal	3
Honeywell	Level 6	Mass Storage Unit	4
Honeywell	Level 6	Master Station Printer Terminal	1
Honeywell	Level 6	Minicomputer	1
Honeywell	Level 6	Printer	2
Honeywell	Level 6	Tape Drive	2
IBM	PC/XT	Microcomputers	3
IBM	PC/XT	Microcomputers Printers	6
Interec Data Systems	Superbrain QD	Microcomputer	2
Intertec Data Systems	Superbrain QDII	Microcomputer	2
Intertec Data Systems	Suberbrain QDII	Microcomputers Printers	1
Lear Siegler	ADM-5	Display Terminal	1
Mannesmann Tally	MT180	Display Terminal Printer	9
Omron/Ramtek	8025AG	Display Terminal	12
Phillips	P3100	Microcomputer	15
Talos	6608	Digitizing Tablet	1
Tandberg Data	TDV 2200 S	Display Terminal	5
Tandberg Data	TDV 2200 S	Display Terminal Printer	4
Tektronix	4054	Digitizing Station	1
Tektronix	4014	Graphics terminal	2
Tektronix	4054	Hard Copy Unit	3
Tektronix	4054	Mass Storage Unit	2
Tektronix	4054	Microcomputer	4
Tektronix	4054	Plotter	1

OFFICE: California State Office - Inventory as of 3/86

MANUFACTURER	MODEL	ITEM DESCRIPTION	QUANTITY
TelVideo Inc.	950	Display Terminal	3
TelVideo Inc.	930	Display Terminal	1
Texas Instruments	*	Hard copy terminal	1
Texas Instruments	787	Portable Terminal	4
Wang	PC	Microcomputer	27
Wang	PC	Microcomputers Printers	13

COLORADO DETAILED INVENTORY

OFFICE: Colorado State Office - Inventory as of 3/86

MANUFACTURER	MODEL	ITEM DESCRIPTION	QUANTITY
3CI	*	Data General/Infocen Level-2 Class III	0
Alanthus Data	T1220	General/Printer Terminal	22
Alanthus Data	T1220	Honeywell L-6/Printer Terminal	1
Altek	ACT462	Data General MV8000/Digitizing Tablet	1
AT&T	DC 6300	Personal Computer	1
Calcomp	8482	Data General MV8000/Digitizing Tablet	2
Calcomp	1073	Data General MV8000/Plotter	1
Codex	LSI4800M	General/Modem	1
Codex	CONV7030	General/Multiplexor	4
Comp. Transceiver System	Execuport 3000	General/Portable Terminal	5
Concord Data	224	General/Modem	2
Data General	9350	Data General MV8000/CPU	1
Data General	D200	Data General MV8000/CRT	4
Data General	6061	Data General MV8000/Disc Drive	2
Data General	6236	Data General MV8000/Disc Drive	1
Data General	4216	Data General MV8000/Line Printer	1
Data General	6194	Data General MV8000/Printer Terminal	1
Data General	6026-AS	Data General MV8000/Tape Drive	2
Data General	3902-35H	Data General/AOS Fortran 5 (under AOS/VS) sources	-
Data General	30	Personal Computer	1
Data General	3902-00H	Data General/AOS Fortran 5 (under AOS/VS)	-
Data General	3928-00H	Data General/AOS Idea (Under AOS/VS)	-
Data General	3910-00H	Data General/AOS Infos II	-
Data General	3924-02H	Data General/AOS RJE80 (under AOS/VS)	-
Data General	3915-01H	Data General/AOS Sort/Merge (under AOS/VS)	-
Data South	DS180	General/Printer	2
Florida Data	DIS130	General/Printer	1
Florida Data	DSP130	General/Printer	1
Gandalf Data	MiniPACXIV	General	1
Gandalf Data	LDS125	General/Modem	8
Hewlett Packard	26211	General/CRT	1
Honeywell	VIP7205	General/CRT	6
Honeywell	VIP7301	General/CRT	12
Honeywell	6-47	Honeywell L-6/CPU	1
Honeywell	VIP7801	Honeywell L-6/CRT	7
Honeywell	MSS9100	Honeywell L-6/Disc Drive	1
Honeywell	CDS9116	Honeywell L-6/Disc Drive	1
Honeywell	MSU9104	Honeywell L-6/Disc Drive	1
Honeywell	PRU9104	Honeywell L-6/Line Printer	1
Honeywell	PRU9109	Honeywell L-6/Line Printer	1

OFFICE: Colorado State Office - Inventory as of 3/86

MANUFACTURER	MODEL	ITEM DESCRIPTION	QUANTITY
Honeywell	TWU9104	Honeywell L-6/Printer Terminal	1
Honeywell	MTU9109	Honeywell L-6/Tape Drive	2
Honeywell	SHL-1412	Honeywell Level 6/Advanced Assembler	-
Honeywell	SHL-1332	Honeywell Level 6/Advanced COBOL	-
Honeywell	SHL-1272	Honeywell Level 6/Advanced Fortran	-
Honeywell	SCH-1492	Honeywell Level 6/Data Entry Facility	-
Honeywell	SHS-1412	Honeywell Level 6/GCOS-6, MOD 400	-
Honeywell	SHP-1132	Honeywell Level 6/Production Facility	-
Honeywell	SCH-2602	Honeywell Level 6/RNP-6	-
Honeywell	SHF-1092	Honeywell Level 6/Sort/Merge	-
IBM	129	General/Card Punch	1
IBM	PC-XT	Personal Computer	1
Infotron Systems	XN790	General/Multiplexor	1
Infotron Systems	SM680	General/Multiplexor	4
Interteck	Hard Disk Drive	General/Disk Drive	2
Interteck	Superbrain	General/Microcomputer	2
Jacobson	A242A	General/Acoustic Coupler	6
Lear Siegler	ADM-3A	Data General MV8000/CRT	1
Lear Siegler	ADM3A+	Data General MV8000/Graphics Terminal	1
Mannesmann Tally	MT180	Honeywell L-6/Printer	3
Microbec	Beehive	General/CRT	1
Multi Tech	CC208	General/Modem Rack W/ Modems	2
Nicolet Zeta	3653SX	Data General MV8000/Plotter	1
Northern Telecom.	MDL78	General/Remote Job Entry Terminal	1
Northern Telecom.	MDL200	General/Tape Drive	1
Penril	300-12	General/Modem	2
Public Domain	*	Data General/Analytical Mapping System (AMS)	-
Public Domain	*	Data General/Automated Digitizing System (ADS)	-
Public Domain	*	Data General/Cartographic Output System (COSS)	-
Philips	PC	Personel Computer	15
Public Domain	*	Data General/Map Overlay and Statistical System (MOSS)	-
Radio Shack	26-1171	General/Acoustic Coupler	1
Ramtek Corp	8130	General/CRT	14
Sanyo	*	Personal Computer	4
TAC	SM-2A	General/Multiplexor	4
Tanberg	TDV2200S	Honeywell L-6/CRT	5
Techtran Industries	9512	General/Micro Disc	2
Tektronix	4954	Data General MV8000/Digitizing Tablet	1
Te[illegible]onix	4014-1	Data Genera[illegible] MV8000/Grahics Terminal	3

OFFICE: Colorado State Office - Inventory as of 3/86

MANUFACTURER	MODEL	ITEM DESCRIPTION	QUANTITY
Tektronix	4054	Data General MV8000/Graphics Terminal	3
Tektronix	4014	Data General MV8000/Graphics Terminal	1
Tektronix	4016-1	Data General MV8000/Graphics Terminal	2
Tektronix	4051	Data General MV8000/Graphics Terminal	1
Tektronix	4631	Data General MV8000/Hard Copy	7
Tektronix	4611	Data General MV8000/Hard Copy	2
Tektronix	4907	General/File Manager	3
Televideo	950	General/CRT	3
Televideo	TVI912	General/CRT	1
Texas Instruments	733ASP	General/Portable Terminal	1
Texas Instruments	765	General/Portable Terminal	1
Texas Instruments	TI810	General/Printer	7
Texas Instruments	TI810	General/Printer	19
Ven-Tel Inc.	EC1200-31	General/Modem	5
Ven-Tel Inc.	MD212-3	General/Modem	34
Visual Technology	V500	Data General MV8000/CRT	2

DSC DETAILED INVENTORY

OFFICE: DSC - Inventory as of 3/86

MANUFACTURER	MODEL	ITEM DESCRIPTION	QUANTITY
Alanthus	T300	Printer Term	3
Alanthus Dec Writer	Digital	Printer (246097)	1
Alanthus Dec Writer	Digital	Printer KSR Terminal (235059)	1
Alanthus Dec Writer	Digital	Printer KSR Terminal (235051)	1
Anadex	*	Printer	1
Anadex	DP9625D	Printer-dot matrix (263841)	1
Anadex	DP9501B	Line Printer	5
Anderson-Jacobson	AJ-1259	Modem	1
Anderson-Jacobson	AJ-1256	Modem	1
Anderson-Jacobson	A-242A	Modem	4
Applicon	AP5500	Color Plotter	1
ATT Lease Lines	3002	Lease Lines	16
Bendix	B1	Control Correlator	1
Calcomp	953	Controller	1
Calcomp	925	Controller	1
Calcomp	8000	Digitizing Tablet	1
Calcomp	9000	Digitizing Tablet	1
Calcomp	1051	Plotter	1
Calcomp	1036	Plotter	1
Calcomp 6000	SBL648B	Digitizing System	1
Calcomp, Inc.	6608	Digitizing Tablet	1
Codex	IMS 7800	Data PBX	1
Codex	LSI 24/24	Modems	4
Codex	LSI 4800	Modems	2
Codex	LSI 9600	Modems	2
Codex	6040	Multiplexers	8
Codex	6001	Multiplexers	2
Codex	6030	Multiplexers	5
Compaq Computer Corp.	Compaq	Microcomputer	7
Execuport	*	Printer Term	20
Computer Devices	1205	Port. Terminal w/Modem Printer	1
Comtal/3M	0108	Image Display Workstation	1
Data 100	8711	CRT	1
Data 100	8202	Tape Drive	2
Data General	Software	AOS	1
Data General	3709-51H	Business Basic Programs (Software)	1
Data General	2302-A	CCIS (Software)	1
Data General	D200/100	CRT	1
Data General	6051	CRT Terminal	1

OFFICE: DSC - Inventory as of 3/86

MANUFACTURER	MODEL	ITEM DESCRIPTION	QUANTITY
Data General	6053	CRT Terminal	6
Data General	9930-A	CS/200 Microcomputer	1
Data General	E6169-NA	Dasher D211 CRT	1
Data General	DG-20	Desktop CPU	9
Data General	4356-A	DG High Speed Matrix Line Printer	1
Data General	6061	Disk Drive	1
Data General	6061-A	Disk Drive	3
Data General	Software	FORTRAN 5, FORTRAN 77	1
Data General	6040	Hard Copy Terminal	1
Data General	4216	High Speed Line Printer	1
Data General	3359-76H	Mapped RDOS (Software)	1
Data General	Eclipse C-330	Minicomputer, 512 kb Memory	1
Data General	1123A	Removable Disk Packs	20
Data General	6021/6023	Tape Drive 800 bpi	1
Data General	6026-S	Tape Drive 800/1600 bpi	1
Data South	DS 180	Printer	4
Data Tech	GIP/CRT	Graphics Processor	1
DEC	VT100	Graphics Display	1
DEC	Rainbow 100+	Microcomputer	1
DEC VAX II	*	5 MB Memory	0
DEC VAX II	*	71 MB Hard Disk	2
DEC VAX II	*	1/2" Tape Cartridge	1
DEC VAX II	*	5 1/4" Floppy	2
DEC VAX II	VT220	Terminal	1
DEC VAX II	VT240	Terminal	1
DEC VAX II	LN03	Laser Printer	1
DEC VAX II	Letterwriter 100	Printer/Terminal	1
DEC VAX II	ULTRIX	UNIX OS	1
DEC VAX II	UNIFY	RDBMS	1
DecWriter	III	Printer	1
Decwriter	LA36	Printer Term	1
DecWriter	LA120	Printer Term	13
DecWriter III	*	Hardcopy	1
Diablo	Printer	620	1
Diablo	31	Disk Drives	2
Digital	DecWriter III	Computer Terminal	2
Digital	LA-120-BA	Hard Copy Terminal	1
Digital	DecWriter III	Terminal	2
Digital Equipment Corp.	DecWriter II	Terminal	3

OFFICE: DSC - Inventory as of 3/86

MANUFACTURER	MODEL	ITEM DESCRIPTION	QUANTITY
Digital LA120	LAS12-BC	Printer	1
Digitech	PACER	Test Equipment	1
Digitech	ENCORE 100	Test Equipment	1
Dunn Instruments	631	Dunn Color Camera	1
Enter Computer Inc.	Graphics Printer	SP-100	1
EPICOM	200	Test Equipment	1
ESL, Inc.	P821-D	Scientific Array Processor	1
Execuport	3000	Hardcopy	1
Execuport	300	Hardcopy	1
Florida DATA	OSP 130	Printer	1
General Elec.	1232	Printer	1
Hayes	1200	Modem	1
Hewlett Packard	9111A	Digitizer	1
Hewlett Packard	9816	Microcomputer	1
Hewlett Packard	7470A	Plotter	1
Hewlett Packard	82901B	Printer	1
Hewlett Packard Co.	7925A	120 MB Disk	6
Hewlett Packard Co.	7905A	15 MB Disk	1
Hewlett Packard Co.	2613A	300 LPM Printer	1
Hewlett Packard Co.	7585A	Drafting Plotter	1
Hewlett Packard Co.	7970B	Mag Tape Drive	1
Hewlett Packard Co.	3000 Series III	Minicomputer	1
Hewlett Packard Co.	2645A	Terminal	2
Hewlett Packard 9000/320	*	4MB Memory	0
Hewlett Packard 9000/320	7914	132MB Hard Disk	2
Hewlett Packard 9000/320	7914	1/4" Tape Cartridge	1
Hewlett Packard 9000/320	7970E	1/2" Tape Drive	1
Hewlett Packard 9000/320	9125	5 1/4" Floppy	1
Hewlett Packard 9000/320	9122	3 1/2" Floppy	2
Hewlett Packard 9000/320	35741A	Graphics Terminal	1
Hewlett Packard 9000/320	2392A	Terminal	4
Hewlett Packard 9000/320	Laser Jet	Laser Printer	1
Hewlett Packard 9000/320	Hitachi HDG3648	Digitizer	1
Hewlett Packard 9000/320	HP9000/310	Graphics Workstation	1
Hewlett Packard 9000/320	HP-UX	OS (UNIX)	1
Hewlett Packard 9000/320	UNIFY, ORACLE	RDBMS	1
Hewlett Packard 9000/320	LIS; DIGICALC	GIS	1
Honeywell	Console	*	1
Honeywell	CPZ300	Card Punch	1

OFFICE: DSC - Inventory as of 3/86

MANUFACTURER	MODEL	ITEM DESCRIPTION	QUANTITY
Honeywell	CPZ301	Card Reader	1
Honeywell	CR-500	Card Reader	1
Honeywell		Central Memory	2
Honeywell	VIP	Consoles	2
Honeywell	DPS 8/70	CPU	2
Honeywell	VIP 7811	CRT	7
Honeywell	7800 T2001B	CRT	1
Honeywell	VIP 7813	CRT	9
Honeywell	VIP 7205	CRT	8
Honeywell	MSS 9104	Disk Drives	3
Honeywell	MSU451	Disk Drives	44
Honeywell	MSU501	Disk Drives	5
Honeywell	*	FNP Console	4
Honeywell	6678	Front End Proc.	1
Honeywell	6661	Front End Proc.	3
Honeywell		IOM	2
Honeywell	MTP601	Mag Tape Controller	1
Honeywell	MSP450	Mass Storage Proc.	4
Honeywell	Level 6/57	Mini Computer	1
Honeywell	URC	Peripheral Cont.	1
Honeywell	3810	Printer	1
Honeywell	G00607	Printer	1
Honeywell	PRU 706X	Printer	1
Honeywell	PR-71	Printers	2
Honeywell	PRU 9109	Printers	2
Honeywell	MTU503	Tape Drives	8
IBM	PC/XT	Microcomputer	1
IBM	PC-M3000	Microcomputer	1
IBM	PC	Microcomputer	1
International Imaging System	70	Image Display Workstation	1
K&E	RSS400	Digitizing Console	1
Kaypro	Micro	KAYPRO II	1
Kaypro	K-2-X	Microcomp. w/Printer, Modem, and Software	1
Kennedy	9800	Tape Drive	1
KYBE	*	Tape Cleaner	2
KYBE	*	Tape Evaluator	1
Leading Edge	F10-55	Printer	1
Lear Siegler	ADM-3	CRT Terminal	6
Lear Siegler	ADM 3	Terminal (246369)	1

OFFICE: DSC - Inventory as of 3/86

MANUFACTURER	MODEL	ITEM DESCRIPTION	QUANTITY
Lear Siegler	ADM 3	Terminal (215226)	1
Liebert	*	Power Distr. Center	1
Mannesmann Tally	MT180	Printer	1
MICOM	M474	Local Multiplexers	4
Modcomp	II/25	CPU	1
Moore	1600	Decollator	1
Nicolet (Zeta)	3653-SX	Drum Plotter	1
Northern Telecom	Series 70	Card Punch	1
Northern Telecom	600	Printer	1
Northern Telecom	73/78	RJE Units	1
Northern Telecom (Data 100)	Series 70	Tape Drive	1
OCLC	100	CRT	1
OCLC	105	CRT	1
Omnimux	40	Multiplexor	1
Omron	8035 G-24	CRT	1
Omron	8025AG	Terminal	34
Omron (Ramtek)	7770	Printer/Terminal (246417)	1
Osborne	Osborne 1	Minicomputer (257747)	1
Racal/Vadic	VA 3451	Modems	2
Ramtek	*	Terminal	1
Ramtek	8025	CRT	5
Ramtek	ADM-3	CRT	1
Ramtek	8025AAG	Omron CRT	1
Ramtek	8130	Terminal	1
Rixon	200	Modem	1
Soroc Tech Inc.	1Q 120	CRT	1
Spectral Data Corp.	RIPS	CPU	1
Sperry-Univac key to disk	CMC 1800	CPU	1
Sperry-Univac	CMC 1225	Disk Drive	2
Sperry-Univac	CMC 108	Keystation	25
Sperry-Univac	237530-001	Printer	1
Sperry-Univac	TP13160	Tape Drive	1
Star Micronics, Inc.	Gemini-10X	Printer	4
Suma Graphic	AC75D-BCD	Digitizing Table	1
Tally	MT 180	Printer	1
Tandberg	TDV 2220S	CRT	1
Tandberg	TDU 2200S	CRT	1
Tektronix	4014	CRT	1
Tektronix	4707	File Manager	1

OFFICE: DSC - Inventory as of 3/86

MANUFACTURER	MODEL	ITEM DESCRIPTION	QUANTITY
Tektronix	4106	Graphics Display	1
Tektronix	4631	Hardcopy	5
Tektronix	46635	Plotter	1
Tektronix	4052	Terminal	1
Tektronix	832	Test Equipment	1
Tektronix	4017	Color CRT Terminal	1
Tektronix	4954	Digitizer Tablet	1
Tektronix	4014	Graphics Terminal	3
Tektronix	4025	Graphics Terminal	1
Tektronix	4014-1	Terminals	1
Teletype	43	Terminal Software: Copy Utility, GRTS, 1004, 2780, 200 UT, Data Conversion for Plotters	1
Televideo	950	CRT	4
Televideo	920	CRT	3
Televideo	9128	Terminal	2
Telex Computer Products	6250/66	Mag Tape Drive	2
Texas Instruments	T1733	Printer Term	1
Texas Instruments	T1820	Printer Term	1
Texas Instruments	T1810	Printer Term	8
Texas Instruments	700 ASR	Data Terminal	2
Texas Instruments	745	Portable Terminal	1
Texas Instruments	810	Printer	1
Texas Instruments	Omni 80	Printer	1
Texas Instruments	Omni 800	Printer	1
Texas Instruments	810	Printer/Terminal	1
Texas Instruments	Omni 800	Remote Terminal	1
Texas Instruments	Silent 700	Terminal (196588)	1
Texas Instruments	Silent 700	Terminal (196591)	1
Texas Instruments	Silent 70	Printer/Terminal (266968)	1
Topaz	70306	Line Regulator	1
Topaz	*	Power Distr. Center	2
Transceiver Systems	3000	(246355)	0
Transceiver Systems Inc.	3810	*	0
Transceiver Systems Inc.	3250	*	0
Trendata	4000	Terminal	1
U.S. Robotics Inc.	-	Modem	1
UARCO	2080	Burster	1
Versatec, Inc.	8222A	Electronic Plotter	1

OFFICE: DSC - Inventory as of 3/86

MANUFACTURER	MODEL	ITEM DESCRIPTION	QUANTITY
Victor	9000	Microcomputer	1
Visual 500	500	CRT/Graphics Terminal	8
Wang	2270-2	2-Disk Drive	2
Wang	2244B	Card Reader	1
Wang	6515-2	CPU	1
Wang	2200-VP	CPU	1
Wang	2282	CRT	1
Wang	2282	CRT Graphics Ter	1
Wang	5905	CRT Terminal	1
Wang	6581W	Daisy Wheel Printer	1
Wang	PCS II	Desktop Comp. with Printer	1
Wang	2262XY	Digitizing CPU	1
Wang	2260	Disk Drive	1
Wang	5521W	Dot Matrix Printer	1
Wang	2223	Keyboard	1
Wang	PC-XC3	Microcomputer	1
Wang	PC	Microcomputer	1
Wang	5947-TC	Mini-Archiver	1
Wang	WA 3451	Modem	1
Wang	PM004B	PC (Micro)	2
Wang	2232B	Plot. Table	1
Wang	FGIW	Printer	1
Wang	22-31W-3	Printer	2
Wang	2233	Printer	1
Wang	6581-1	Printer/Daisy	1
Wang	5577	Printer/Dot M	1
Wang	2200-LVP8X	Processor	1
Wang	446-0058	Screen Filter	3
Wang	OIS-115-3	System CPU	1
Wang	5536-4	Terminal	3
Wang	2226	Terminal	1
Wang	PC-XC3	Winchester Disk	1
Wang	5536-4	Workstation	1
Wang	OIS	Workstation	1
Wang	LR50719	Workstation	2
Wang	TC-5536-2	Workstation	1
Xerox	16/8	Microcomputer Printer, Winchester Disk Drive	1

ESO DETAILED INVENTORY

Office: Eastern States Office - Inventory as of 3/86

Manufacturer Name	Model	Item Description	Number
Alanthus	T-1220	Printer/Terminal	4
Beehive	Micro 8	Microcomputer	2
Burroughs	4KB	CPU 01	2
Computer Dev.	Mini-Terminal	Terminal	1
Data South	DS 180	Printer	1
Epson	FX80	Printer	1
Epson	FX100	Printer	4
Epson	MX100 III	Printer	1
Epson	H108A	Multi-Function Unit	1
Execuport	4000	Printer/Terminal	4
Honeywell	CPX9810	Microcomputer 610	1
Honeywell	MTU9109	Magnetic Tape Unit	1
Honeywell	CDS9116	Magnetic Disc Unit	1
Honeywell	MSS9104	Magentic Disc Unit	1
Honeywell	MS49104	Magnetic Disc Unit	1
Honeywell	DSS-10	Magnetic Disc Unit	1
Honeywell	MSU9104	Magnetic Disc Unit	1
Honeywell	9114A	Magnetic Disc Unit	2
Honeywell	CMC9038	EDAC, Memory Storage Unit	1
Honeywell	7205	Terminal	4
Honeywell	VIP-7801	Terminal	4
Honeywell	TWU 9104	Terminal	2
Honeywell	300 LPM	Printer	1
Honeywell	PRU 9104	Printer/Terminal	1
Hewlett-Packard	2621P	Terminal	1
Intertec	Superbrain QD	Microcomputer	3
Itoh Electronic	8510	Printer	1
Kaypro	Robie	Microcomputer	1
Mannesman-Tally	MT-180I	Printer	5
Philips	P-3100 PC	Microprocessor	2
Ramtek	8025	Terminal	4
Sperry Univac	4243	Magnetic Tape Unit	1
Tandberg	TDV22005	Terminal	9
Tektronix	4695	Printer	1
Teleram	3100/2	Microcomputer	1
Teleram	3620	Floppy Disk Drive	1
Televideo	950	Terminal	1
Texas Instruments	810	Terminal	1
Texas Instruments	800	Terminal	1
Texas Instruments	OMNA	Terminal	1

Office: Eastern States Office - Inventory as of 3/86

Manufacturer Name	Model	Item Description	Number
020 - Jackson District Office			
Execuport	4000	Printer/Terminal	1
Televideo	950	Terminal	1
Data South	DS180	Printer	1
030 - Milwaukee District Office			
Execuport	4000	Printer/Terminal	1
Computer Dev.	Miniterm	Terminal	1
Televideo	950	Terminal	1
Data South	DS180	Printer	2

IDAHO DETAILED INVENTORY

OFFICE: Idaho State Office - Inventory as of 3/86

MANUFACTURER	MODEL	ITEM DESCRIPTION	QUANTITY
Tektronix	S9602B	Image Handling Un.	1
-	-	Modem	1
Alanthus	TC30061	Acoustic Coupler	2
Anderson/Jacobsen	AJ-460	Input Console	1
Burroughs	L9938200	Acctg. Forms Printer	1
Codex Corp.	6000	(DSC)Multiplexer	1
Codex Corp.	IMS7800	Contention Unit	1
CPS Corp.	PMK2045	PowerMite Pwr. Supply	1
CTS/Execuport	4000	Portable TTY Term/Pr.	1
Da-Pro	55	Switch	1
Da-Pro	110S5	Switch CRT/Printer	2
Da-Pro	55-51-140	Printer Configuration	1
Data General	-	GIS Equipment	1
Dec/Alanthus	T1210	TTY Terminal/Printer	1
Dec/Alanthus	T1220	TTY Terminal/Printer	12
Dest Corp.	202	Optical Scanner	1
Elect.Dev.Inc.	0044	Display Unit (loan I3)	1
Epson	FX100	Dot Matrix Printer	1
Gandalf	120B	Modem	16
Gandalf	122	Modem	11
Gandalf	PS910	Rack Mount Modems	1
GE	1232	Printer	1
Halcyon	801	Mini Fox Data Monitor	1
Honeywell	CRU9108	Card Reader	1
Honeywell	CDU9116	Cartridge Dsk Drive	2
Honeywell	43	Central Processor	1
Honeywell	VIP7800	CRT Terminal	1
Honeywell	VIP7201	CRT Terminal	5
Honeywell	VIP7205	CRT Terminal	3
Honeywell	VIP7801	CRT Terminal	2
Honeywell	VIP7813	CRT; Input Console	1
Honeywell	VIP7301	CRT; Input Consoles	2
Honeywell	MTU9109	Disk Tape Drive	2
Honeywell	PRU9109	Hi-speed Printer	2
Honeywell	AJ460	Input Console Dsk Un	1
Honeywell	VIP7205	Input/Status Console	1
Honeywell	PRU7006	Ltr-Quality Printer	1
Honeywell	MSS9104	Mass Storage Units	3
Honeywell	TW09104	Operator Console	1

OFFICE: Idaho State Office - Inventory as of 3/86

MANUFACTURER	MODEL	ITEM DESCRIPTION	QUANTITY
IBM	3	Card Data Recorder	1
Int. Data Sci. Inc.	60	EIA Int/Breakout Box	1
Intertec	Superbrain	Microcomputer	1
Mannesmann/Tally	MT180I	Dot Matrix Printer (loan ARS)	1
Mannesmann/Tally	MT180I	Dot Matrix Printer	16
Monroe	1830	Calculator	2
Monroe	1620	Input/output Printer	1
Monroe	392RW	Magnetic Tape Unit	1
Okidata	84	Printer	1
Paradyne	2961-01	Multiplexer	1
Ram	11-001	Acoustical modems	2
Ramtek/Omron	802AG	CRT	2
Ramtek/Omron	8130	CRT	7
Ramtek/Omron	8025	CRT	1
Ramtek/Omron	8025AG	User Room Crt	2
Science Acc.	GP-3	Digitizer	1
Sola	-	Line Voltage Regul.	1
T-Bar Inc.	5722	Switch CRT/Printer	5
Tandberg	TDV2200S	CRT (1 loan ARS)	2
Tandberg	TDV2200S	CRT Terminal	24
Tektronix	4010-1	Card Terminal	1
Tektronix	4631	GIS Printer	1
Tektronix	4114A	GIS Terminal	1
Tektronix	4610	Hard-copy Unit	1
Teletype	43	TTY Terminal	1
Televideo	950	CRT Terminal	2
Texas Inst.	765	TTY Terminal	1
Texas Inst.	OMNI800	TTY Terminal	1
Texas Inst.	OMNI800	TTY Terminal/Printer	1
Texas Inst.	765	TTY Terminal/Printer	1
Topaz	22072	Line Voltage Regulat.	2
UDS	212LP	Modem	4
UDS	103JLP	Modem	7
UDS	212A	Modem	1
UDS	212LP	Modem (loan 12)	1
UDS	212LP	Modem (loan 13)	1
UDS	103JLP	Modem (loan I1)	1
UDS	212LP	Modem (loan I39)	1
Ven-Tel	212-3E	Autocial modem	1
Ven-Tel	212-3E	Autodial (loan I3)	1

OFFICE: Idaho State Office - Inventory as of 3/86

MANUFACTURER	MODEL	ITEM DESCRIPTION	QUANTITY
Ven-Tel	ED1200-31	Autodial Modem	1
Ven-Tel	AD103-1	Modem	1
Wang	4250-0A	Arch. Wkstn.	1
Wang	OIS-140	CPU	1
Wang	2236DE	CRT Terminal	1
Wang	2270-2	CRT Terminal	1
Wang	PC-PM016	Dot Matrix Printer	1
Wang	DSF-55	Dual Sheet Fdr.	4
Wang	2231W3	Graphic Printer	1
Wang	PC-PM014	Ltr-Quality Printer	1
Wang	PC-XC3	Micrcomputer	2
Wang	2200VP	Microcomputer	1
Wang	DW/OS-55	Printer	4
Wang	64K OIS	Workstation	11
Wang (Misso)	PC-PM016	Dot Matrix Printer	1
Wang(Misso)	PC-XC3	Microcomputer	1
Wright Line	-	Tape Storage Units	2
Xerox	1700	TTY Terminal	1

MONTANA DETAILED INVENTORY

OFFICE: Montana State Office - Inventory as of 10/85

MANUFACTURER	MODEL	ITEM DESCRIPTION	QUANTITY
Alanthus	T320	Printer Terminal	2
Alanthus	T300	Printer Terminal	1
Altek	-	Console	1
Altek	-	Digitizer	1
Altek	-	Table	1
Altek	-	Tape Unit	1
Anadex	-	Printer	3
AT&T	-	Telecomm. Circuits (1200 Baud)	7
AT&T	-	Telecomm. Circuits (4800 Baud)	4
Beehive	DM30	Microcomputer, MicroB	1
Burroughs	-	Microcomputer	1
Codex	6030	Multiplexer	1
Data General	-	Microcomputer, Disk Drive	3
DataSouth	DS180	Printer	4
DEC	T1220	Printer Terminals	8
Dynatech	-	Multiplexers	8
Gandalf	-	Matrix Switch	1
General Electric	T1232	Printer Terminals	3
Honeywell	57	16-Port MLCP	2
Honeywell	47	Cartridge Disk 10 megabyte	1
Honeywell	47	Mass Storage Units 256 megabyte	3
Honeywell	47	Minicomputer 2 megabyte	1
Honeywell	47	Printer 300 LPM	1
Honeywell	47	Printer 900 LPM	1
Honeywell	57	SIP	-
Honeywell	47	Tape Drives 9-Track	2
Honeywell	57	Upgrade	-
Honeywell	7305	VIP Terminals	2
Honeywell	7801	VIP Terminals	8
Honeywell	7205	VIP Terminals	8
Honeywell	7813	VIP Terminals	4
IBM	-	Disk Drive	1
IBM	-	PC Microcomputer	1
IBM	-	Printer	1
Mannesmann Tally	MT180	Printer	25
Micro Peripheral Inc.	-	Printer	1
Nicolet Zeta	3610	Plotter	1
Nicolet Zeta	C63	Tape Controller	1
OCLC	-	CRT Terminal (Loaner)	1
Okidata	-	Printer	1

OFFICE: Montana State Office - Inventory as of 10/85

MANUFACTURER	MODEL	ITEM DESCRIPTION	QUANTITY
Omnidata	217	Datapod/Cassette Reader	1
Omron	8025	CRT Terminals	4
Ramtek	8130	CRT Terminals	2
Tandberg	TDV 2200 S	CRT Terminals	30
Tektronics	4907	Disk Drives	6
Tektronics	4611	Hard Copier	3
Tektronics	4054	Microcomputer	3
Televideo	950	CRT Terminals	5
Texas Instrument	0040	Compact Computer	2
Texas Instrument	-	Printer/Plotter	2
Texas Instrument	733	Terminal	1
Ven-Tel	MD-212-1E	Modem	20
Wang	PC3	-	14
Wang	2200	Microcomputer, Printer, Disk Drive	1

NEVADA DETAILED INVENTORY

OFFICE: Nevada State Office - Inventory as of 3/86

MANUFACTURER	MODEL	ITEM DESCRIPTION	QUANTITY
Alanthus	ADM-3	CRT	7
Alanthus	LA-36	Hardcopy	8
Alanthus	LA-100	Hardcopy	12
Alanthus	LA-120	Hardcopy	5
AT&T	3002 Lines	Data Circuit	1
Data General	20	CPU	2
Data General	VIS500	Terminal	2
Execuport	3000	Portable Term	6
FTS	Comm Lines	Dial-up Circuit	1
General Elec	Terminet	Hardcopy	1
Henco	INFO 8	Release 9.0	1
Honeywell	PRU 9104	300 lpm Printer	1
Honeywell	PRU 9109	900 lpm Printer	1
Honeywell	ZHL 1412	Advanced Assember (MACRO)	1
Honeywell	ZHL 1332	Advanced COCOL	1
Honeywell	ZHL 1272	Advanced FORTRAN	1
Honeywell	ZHL 1312	BASIC Interpreter/Compiler	1
Honeywell	CRU 9101	Card Reader	1
Honeywell	TWU 9104	Console	1
Honeywell	VIP7205	CRT	8
Honeywell	VIP7801	CRT	4
Honeywell	VIP7813	CRT	3
Honeywell	ZHC 1492	DEF II, Data Entry Facility	1
Honeywell	ZHS 1412	GCOS 6-MOD 400-REL.3.0	1
Honeywell	ZHC 2602	LHDLC, Remote Facilities	0
Honeywell	MSU 9104	Mass Storage	2
Honeywell	Level-6	Minicomputer	1
Honeywell	ZHF 1092	Sort Merge Utility	1
Honeywell	MTU 9101	Tape Drives	2
Honeywell	ZHP 1132	UPF-Production Facility	1
Micom	6212	Modem	6
Micom	6210	Outdial	1
Micom	Micro600	Port Selector	1
Nevada Bell	3002 Lines	Data Circuit	2
Nevada Bell	Comm Lines	Dial-up Circuit	16
Nevada Bell	Comm Lines	Watt Lines	2
Racal-Vadic	VA3457PX3	Modem	13
Racal-Vadic	VA3451PA	Modem	28
Racal-Vadic	VA811DX MX3	Modem	1
Racal-Vadic	VA3481PM3	Modem	2
Racal-Vadic	VA 831 A3	Modem	1

OFFICE: Nevada State Office - Inventory as of 3/86

MANUFACTURER	MODEL	ITEM DESCRIPTION	QUANTITY
Ramtek	8025	CRT	6
Rixon	T103J	Modem	1
Sikes	822-S565	Dual Disk Dr	1
Sikes	812-S560	Single Disk Dr	6
Tally	MT180I	Printer	13
Tanberg	TDV2200S	CRT	14
Tektronix	4907	Disk Drive	2
Tektronix	4054	Graphics CRT	1
Tektronix	4663	Plotter	1
Tektronix	4956	Tablet	1
Televideo	950	CRT	1
Texas Inst.	810RO	Printer	1
Ven-Tel	MD212	Modem	5
Wang	DW/OS-55	55 cps Daisy	1
Wang	PC-PM014	Daisy Printer	2
Wang	PC-PM016	Matrix Printer	7
Wang	PC-PM005	Microcomputer	9
Wang	OIS-105	Word Processor	2
Wang	OIS-130A	Word Processor	1
Wang	OIS-50	Word Processor	1
Wang	OIS-40	Word Processor	8
Zeta	3653SX	Drum Plotter	1

NEW MEXICO DETAILED INVENTORY

OFFICE: New Mexico State Office - Inventory as of 3/86

MANUFACTURER	MODEL	ITEM DESCRIPTION	QUANTITY
Apple	Apple IIC	Microcomputer	2
Burroughs	CPU MDL 3185	CPU	1
Burroughs	7318	Magnetic Disk Unit (1)	1
Burroughs	MDL B92453	Printer	1
Burroughs	MT 983	Video Display	3
Codex	IMS-7800	Intelligent Matrix Switch	1
Codex	9600	Modem	11
Codex	6005	Multiplexor	11
Codex	6030	Multiplexor	1
Data General	TP 1	Hardcopy Printer	1
Data General	4216	Line Printer	1
Data General	6236	Logical Disk Units	2
Data General	6026	Logical Disk Units	3
Data General	Eclipse M/600	Minicomputer	1
Data General	6061	Tape Drive	1
Data General	6053	Terminals	9
DataSouth	DS-180	Dot-Matrix H/C/ Printer	2
Decwriters II	*	Hardcopy	21
Henco	INFO-9	*	1
Honeywell	ZHC 1412	ADV. Assembler	1
Honeywell	ZHL 1332	ADV. Cobol	1
Honeywell	9101	ASYNC Comm.	2
Honeywell	9116	Cartridge Disk	1
Honeywell	9104	Comm. Pac.	1
Honeywell	7801	CRT	15
Honeywell	7813	CRT	26
Honeywell	7205	CRT	6
Honeywell	ZHC 1492	DEF-II	1
Honeywell	9101	Diskette	1
Honeywell	CMC 9038	EDAC Memory	8
Honeywell	ZHS 1412	GCOS-6 MOD 400	1
Honeywell	9106	HDLC Comm. Proc.	1
Honeywell	9104	Line Printer (300)	1
Honeywell	9109	Line Printer (900)	1
Honeywell	9104	Mass Storage Units	3
Honeywell	47	Minicomputer	1
Honeywell	NMLCP	Multiline Comm. (16 ports)	2
Honeywell	9103	Multiline Comm. Proc.	1
Honeywell	ZHP 2602	RNP-6 with LHDLC, RFF, RBF, FII, RCF, ATI	0
Honeywell	*	Scorpeo	1

OFFICE: New Mexico State Office - Inventory as of 3/86

MANUFACTURER	MODEL	ITEM DESCRIPTION	QUANTITY
Honeywell	7813	Slave Printer	16
Honeywell	7066	Slave Printer	1
Honeywell	ZHF 1092	SORT/MERGE	1
Honeywell	(7813)	Tandberg CRT	2
Honeywell	9109	Tape Drives	2
Honeywell	1132	UPF	1
Omron/Ramtek	*	CRT	5
Racal-Milgo	VA-212	Auto-Dial Modem	4
Racal-Milgo	24LSI	Modem	1
Racal-Milgo	MPS48	Modem	3
Racal-Milgo	MPS 9601	Modem	4
Racal-Milgo	24LSI	Modem	10
Racal-Milgo	160	Multiplexor	6
Racal-Milgo	080	Multiplexor	7
Racal-Milgo	320	Multiplexor	4
Tektronix	4014	Graphics Terminal	6
Tektronix	4054	Graphics Terminal	1
Ven-Tel	MD212	Modem	4
Visual	500	Graphics Terminal	2
Wang	5577	192/40 Matrix Printer	1
Wang	6581W	35 CPS Daisy Printer	5
Wang	6581WC	35 CPS Daisy Printer	12
Wang	DN/05-55	55 CPS Daisy Printer	2
Wang	4250-0A	64K Arch Workstation	2
Wang	5846-4	64K Engo Workstation	1
Wang	TC-5846-4	64K Engo Workstation	1
Wang	5947	64K Mini Archiving Workstation	9
Wang	TC-5947	64K TC Archiving Workstation	1
Wang	5536-4	64K Workstation	1
Wang	5846-4	64K Workstation	1
Wang	5846-4	64K Workstation	2
Wang	015-140-3	Central Processing Unit	1
Wang	015-40	Central Processing Unit	5
Wang	015-105	Central Processing Unit	2
Wang	015-115-2	Central Processing Unit	3
Wang	015-60	Central Processing Unit	2
Wang	6581-WC	CPS Daisy Printer	1
Wang	DW/05-55	Daisy Printer 55 CPS	1
Wang	PC-003B	Microcomputer	2
Wang	PC-XC3	Microcomputer	3

OFFICE: New Mexico State Office - Inventory as of 3/86

MANUFACTURER	MODEL	ITEM DESCRIPTION	QUANTITY
Wang	PC-XC4	Microcomputer	1
Wang	WS-5947	Mini Archiver	1
Wang	TC-5536-4	TC Workstation 64K	1
Wang	5536-4-TC	Telecommunicating Workstation	1
Wang	TC-5846-4	Telecommunicating Workstation	1
Wang	WS-5536-4	Workstation 64K	2
Wang	5947	Workstation 64K Mini Arching	1
Zeta	3610/C63	Plotter	2
Zeta	3653 SX	Plotter	1

OREGON DETAILED INVENTORY

OFFICE: Oregon State Office - Inventory as of 3/86

MANUFACTURER	MODEL	ITEM DESCRIPTION	QUANTITY
Alanthus	S-550	Disk Unit	1
Calcomp	5180	Plotter	7
Data General	Dasher	CRTS	4
Data General	D410	CRT	8
Data General	Model 20	Microcomputer	2
Data General	C-330	Printers	1
Data General	C-330	Mass Storage Units	3
Data General	C-330	Tape Drives	1
Data General	C-330	Minicomputer	1
Data General	C-330	Mass Storage Unit	3
Datapoint	-	CRT	1
Datapoint	-	Printing Terminal	1
DEC	Rainbow 100	Microcomputer	1
Digital	LA-120	Printing Terminal	26
Digital	LA-100	Printing Terminal	1
Epson	-	Printer	4
GE	Terminet	Printing Terminal	1
Hewlett-Packard	9020	Minicomputers	6
Hewlett-Packard	9845	Minicomputers	1
Hewlett-Packard	7574	Plotter	2
Honeywell	7205	CRT	4
Honeywell	7801	CRTS	4
Honeywell	Level 6	Mass Storage Units	3
Honeywell	Level 6	Tape Drives	2
Honeywell	Level 6	Minicomputer	1
Honeywell	Level 6	Card Reader	1

OFFICE: Oregon State Office - Inventory as of 3/86

MANUFACTURER	MODEL	ITEM DESCRIPTION	QUANTITY
Honeywell	Level 6	Printers	2
IBM	3178	CRT	1
IBM		Card Punch	1
Intertec	Superbrain	Microcomputer	4
Kaypro	-	Microcomputer	2
Lear-Siegler	ADM-5	CRT	1
Mannesman/Tally	-	Printer	33
Okidata	84	Printer	1
Okidata	82	Printer	4
Omnidata		Data recorder	53
Omron (Ramtek)	8025	CRT	22
Philips	-	Microcomputer	15
Radio Shack	TRS-80	Microcomputer	21
Rixon	-	Multiplexor	16
Sikes	8230	Disk Unit	1
Tandberg	-	CRT	42
Techtran	-	Disk Unit	11
Tektronix	4631	Hard Copier	3
Tektronix	4014	Terminals	5
Tektronix	4954	Graphics Tablet	3
Tektronix	4125	Terminals	1
Televideo	950	CRT	1
Texas Instruments	765	Printing Terminal	7
Visual	100	CRT	1
Wang	PC	Microcomputer	62
Zeta	-	Plotter	1

WYOMING DETAILED INVENTORY

OFFICE: Oregon State Office - Inventory as of 2/85

MANUFACTURER	MODEL	ITEM DESCRIPTION	QUANTITY
Honeywell	Level 6	Printers	3
IBM	3178	CRT	1
IBM		Card Punch	1
Intertec	Superbrain	Microcomputer	4
Kaypro	-	Microcomputer	7
Lear-Siegler	ADM-5	CRT	1
Mannesmann-Tally	-	Printer	33
Okidata	84	Printer	1
Okidata	83	Printer	4
Omnidata		Data recorder	[illegible]
Omron (Ramtek)	8025	CRT	[illegible]
Philips	-	Microcomputer	[illegible]
Radio Shack	TRS-80	Microcomputer	[illegible]
Rixon	-	Multiplexer	[illegible]
Sykes	8220	Disk Unit	1
Televideo	-	CRT	43
Tecmar	-	Disk Unit	1
Tektronix	4631	Hard Copier	5
Tektronix	4014	Terminals	6
Tektronix	4954	Graphics Tablet	8
Tektronix	4105	Terminals	1
[illegible]	[illegible]	CRT	1
Texas Instruments	700	Printing Terminal	1
Visual	[illegible]	CRT	1
Wang	[illegible]	Microcomputer	[illegible]
Zeta	[illegible]	Plotter	[illegible]

OFFICE: Wyoming State Office - Inventory as of 3/86

MANUFACTURER	MODEL	ITEM DESCRIPTION	QUANTITY
Access	-	Microfiche Retriever	1
ADM	3A	CRT	1
ADS	Viewpoint	CRT	3
Altec	-	Digitizer	3
Anadex	DP9500	Printer	3
Beehive	DM-30	CRT	1
Beehive	Micro 3	CRT	1
Bell	212A	Data Phone	1
Bell	209	Data Phone	1
Burroughs	B94	CPU	1
Burroughs	MT985	CRT	4
Burroughs	B9493-20	Fixed Disk	1
Burroughs	B92	Printer	2
Burroughs	AP330	Validator	2
Calcomp	1073	36" Vector Plotter	4
Calcomp	9000	Digitizer	4
Calcomp	8000	Digitizers	2
Codex	200	DNC5	1
Codex	7800	IMS	1
Codex	SP14.4	Modem	5
Codex	CS9600	Modem	9
Codex	SP14.4	Modem	5
Codex	6005	Multiplexer	21
Codex	6030	Multiplexer	1
Data General	6040	Console	1
Data General	M-600	CPU	1
Data General	6053	CRT	0
Data General	D200	CRT	0
Data General	6122	Disk Drive	1
Data General	6061	Disk Drive	1
Data General	-	Disk Packs	15
Data General	M20	Microcomputer (incld. Printer & Disk Drive)	1
Data General	M10SP	Microcomputer (includes Printer and Disk Drive)	1
Data General	M20	Microcomputer (includes Terminal, Printer, and Disk	
Drive)	1		
Data General	4300	Printer	1
Data General	6026	Tape Drive	1
Data General	-	Tapes	63
Data South	DS180	CRT	1
Data South	DS180	Printer	9
Dest	202	OCR	1
DG	Dashers	CRT	2
Digital	LA120	Printer/Term	17
Digital	DEC-100	Printer/Term	5
Florida Data	BNV	Printer	1

OFFICE: Wyoming State Office - Inventory as of 3/86

MANUFACTURER	MODEL	ITEM DESCRIPTION	QUANTITY
Honeywell	CDS9116	Cart Disk	1
Honeywell	-	Cart. Disks	30
Honeywell	TWU9104	Console	1
Honeywell	57	CPU	1
Honeywell	7205	CRT	5
Honeywell	7813	CRT	3
Honeywell	7801	CRT	11
Honeywell	MSU9104	Disk Drive	2
Honeywell	DIU9103	Diskette Drive	1
Honeywell	PRU9109	Printer	1
Honeywell	PRU9103	Printer	1
Honeywell	MTU9109	Tape Drive	2
Honeywell	-	Tapes	60
Honeywell Software	SHL928	Assembler	1
Honeywell Software	SHL933	Cobol A	1
Honeywell Software	SHL917	Data Entry F	1
Honeywell Software	SHL927	Fortran A	1
Honeywell Software	-	INFO	1
Honeywell Software	SHS915	Mod 400 Ex	1
Honeywell Software	SHC964	RNP/6	1
HP	1000	Computer	1
HP	2621P	CRT	1
IBM	PC-XT	Micro Computer (inclu. Printer/Disk Drive)	6
Intertec	Superbrain	Microcomputer	2
Lear Siegler	ADM-3A	CRT	1
Lear Siegler	ADM-31	CRT	1
Lear Siegler	ADM-5	CRT	1
Paradyne	Infolock	Encryption	1
Ramtek (Omron)	8025AG	CRT	7
Software	-	ADS/Moss	0
Software	3625	AOS Exec	1
Software	3626	Fortran 5	0
Software	3632	Sort/Merge	0
Summagraphics	ID	Digitizer Controller	1
System Ind	9751	Disk Drive	2
Tally	MT180	Printer	15
Tandberg	TDV2200	CRT	29
Tektronics	4631	Hard Copier	3
Tektronics	4907	1-8" Disk Drive	1
Tektronics	4907	2-8" Disk Drive	1
Tektronics	4907	3-8" Disk Drive	3
Tektronics	4907	3-9" Disk Drive	1
Tektronics	4956	Digitizer	1
Tektronics	4114	DVST CRT	1
Tektronics	4014	DVST CRT	2

OFFICE: Wyoming State Office - Inventory as of 3/86

MANUFACTURER	MODEL	ITEM DESCRIPTION	QUANTITY
Tektronics	4016	DVST CRT	2
Tektronics	4054	DVST CRT (64K)	7
Tektronics	4631	Hard Copy	6
Teletype	TTY43	Printer/Terminal	7
Televideo	950	CRT	13
Televideo	924	CRT	1
Televideo	914	CRT	2
Televideo	940	CRT	1
Televideo	950	Graphics CRT	2
Texas Instruments	OMNI800	Printer	1
Texas Instruments	865	Printer	1
Trans Era	6400	Memory IBM	1
Ven-Tel	MD212-2	Modem	21
Ven-Tel	MD212-4L	Modem	4
Ven-Tel	MD212-PLUS	Modem	2
Ven-Tel	MD212-3	Modem	1
Ven-Tel	FMD272-2	Modem	6
Versatec	8236F	36" Electrostatic	1
Wang	4250-OA	Arch Workstation	3
Wang	5947-TC	Arch. WIC Stations	3
Wang	6529	Cartridge Tape Drive	2
Wang	6540-3	CPU	3
Wang	OIS-50	CPU	6
Wang	6515-4	CPU	1
Wang	6515-3	CPU	1
Wang	OIS-60	CPU	2
Wang	OIS-40	CPU/Work Station	2
Wang	6565	Disk Drive	2
Wang	PC-XC3	Microcomputer	1
Wang	PC	Microcomputer (includes Printer and Disk Drive)	1
Wang	6581W	Printer	17
Wang	DW/OS-55	Printer	8
Wang	5577	Printer	7
Wang	PTR-20	Printer	1
Wang	6581WC-1	Printer	2
Wang	OIS-TC	TC	10
Wang	5947-4TC	Arch Workstation	3
Wang	5947-TC	Arch Workstation	3
Wang	TC-AWS-4	Arch Workstation	1
Wang	5846-4TC	Arch Workstation	1
Wang	4230-TC	Workstation	4
Wang	OIS-TC		1
Wang	5846-4	Workstation	13
Wang	4230-OA	Workstation	26
Wang	5846-4	Workstation	7
Zeta	3610	Vertor Plotter with Controller	1

UTAH DETAILED INVENTORY

OFFICE: Utah State Office - Inventory as of 3/86

MANUFACTURER	MODEL	ITEM DESCRIPTION	QUANTITY
A.M. Varityper	5310	Photocomposer	1
Altek	ATC46-3	Digitizer	1
Amtext	425	Word Processing	5
Anderson-Jacobson	A2424	Acoustic Coupler	5
Beehive	Micro-B	CRT	1
Black Box	Rib	Ring Indicator Box	1
Black Box	Bob	Breakout Box	6
Black Box	ALBC-25	Switch Box ABC	1
Black Box	Sam+	Interface Monitor	1
Black Box	SW075	Switch Box ABC RJ-11	1
Calcomp	S9602-B	Digitizing Tablet	1
Codex	LSI 24/24	Modem	2
Codex	47850	CRT	1
Codex	60120	Multiplexor	2
Codex	IMS7800	Intel. Matrix Switch	1
Codex	66031	Multiplexor	1
Comp Power Sys	25	Power Distribution	1
CTS Inc.	4000	Portable Terminal	3
CTS Inc.	3810	Portable Terminal	3
Data Sciences	60 EIA	Interface Monitor	3
Data South	DS-180	Printer	4
Data South	DS-180+	Printer	4
Dataproducts	M-100L	Printer	4
Datascribe	III	Lettering Machine	1
Digital	1210	Printer Terminal	3
Digital	T300	Printer Terminal	1
Digital	LA512-BC	Printer	1
Digital	1220	Printer Terminal	19
Eaton	LRC 7000	Printer	6
Epson	MX-80	Printer	4
Epson	EX-80	Printer	1
Fibronics	FM039-2	Wang Coax Balun	2
Florida Data	OSP130	Printer	1
Gandalf	PIN9106	Multiplexer	2
Gandalf	MLDS-122F	Short Haul Modem	10
Gandalf	SMLDS 349	Short Haul Modem	2
Gandalf	MLDS-122	Short Haul Modem	60
General Elec	1232	Printer Terminal	1
Gulf & Western	1000	Security Monitor	1
Halcyon	H4896	Modem	2
Halycon	801A-08	Data Monitor	1
Hewlett-Packard	HP9114A	Disk Drive	1
Honeywell	DCE9606	----	1
Honeywell	SHL127	Advanced Fortran	1

OFFICE: Utah State Office - Inventory as of 3/86

MANUFACTURER	MODEL	ITEM DESCRIPTION	QUANTITY
Honeywell	PRU9104	300 LPM Printer	1
Honeywell	DCM9101	Async Comm Pac	1
Honeywell	PRU9109	900 LPM Printer	1
Honeywell	CDS9116	Cartridge Disk Unit	1
Honeywell	CAB9036	Cabinet	1
Honeywell	CPS9561	Central Processor L6	1
Honeywell	CAB9037	Cabinet Expanison	2
Honeywell	KCM9101	Console Dev Pac	1
Honeywell	VIP7801	CRT	5
Honeywell	VIP7813	CRT	14
Honeywell	SHC949	Data Entry FAC II	1
Honeywell	VIP7205	CRT	9
Honeywell	SHF909	GCOS-6 Sort Utility	1
Honeywell	SHL933	GCOS 6 Adv. COBOL	1
Honeywell	DCM9106	HDLC Comm Pac	1
Honeywell	SHL928	GCOS 6 Ass./Mac. Pro	1
Honeywell	SHD908	INFO-6	1
Honeywell	MSU9104	Mass Storage Unit	1
Honeywell	MTC9102	Mag Tape Drive .	1
Honeywell	MSS9104	Mass Storage Unit	1
Honeywell	MTU9109	Mag Tape Drive	2
Honeywell	CMC9654	Memory 1024KB	1
Honeywell	CPF9519	MDL 43 to 47 Upgrade	1
Honeywell	CMC9038	Memory 256KB	3
Honeywell	CAB9402	Megabus Expan 9-Slot	1
Honeywell	CMM9006	Memory 32KB	3
Honeywell	SHS921	MOD 400 Executive	1
Honeywell	CMC9009	Memory Control W/32K	1
Honeywell	MLC9103	Multiline Comm Pac	2
Honeywell	CPF9501	Memory Mgt Option	1
Honeywell	TWU9104	Operator Console	1
Honeywell	MLC9640	Multiline Comm Pac	1
Honeywell	PSS9004	Power Dist. Unit	1
Honeywell	MDC9101	Multiple Dev Control	1
Honeywell	DCM9103	Sync Comm Pac	1
Honeywell	PRM9101	Printer Dev Pac	2
Honeywell	PRF9102	Vertical Format Unit	1
Honeywell	SHC964	RNP-6	1
Honeywell	DCM9101	Async Comm Pac	4
Honeywell	MSC-9615	Controller	2
Honeywell	CPK 70	47-57 Upgrade	1
Honeywell	MSU-9619	Disk Drive	1
Honeywell	SHC949	Data Entry Fac II	1
Honeywell		Mag Disk Unit	1

OFFICE: Utah State Office - Inventory as of 3/86

MANUFACTURER	MODEL	ITEM DESCRIPTION	QUANTITY
Honeywell	VAF7821	Buffered Pir Adaptor	1
Honeywell	PRU7066	Printer	1
IBM	XT	Micro-Computer	1
IBM	5160	Mag Disk Unit	1
Infotron	CA600/4790	Remote Quad 1/0 Card	4
Infotron	CA790/4M4	Quad Channel Adapter	6
Infotron	CL790LM380	Link Module	2
Infotron	SM600/9600	Multiplexer	1
Infotron	CL790LM600	Link Module	1
Infotron	SM616/5790	Romote Link Unit	1
Infotron	SM388/9600	Multiplexer	2
Infotron	792/V.29DS	Modem	2
Infotron	992NP/SU	Network Processor	1
Intertec	D5510	Disc System	1
Intertec	Superbrain	Micro Computer	1
IQ Technologies	SC817	Smart Cable	1
Lanier	103	Word Processing	2
Lanier		Word Processing	1
Lear Siegler	ADM-22	CRT	1
Lear Siegler	V-203	CRT	5
Lear Siegler	ADM-5	CRT	1
Mannesmann/Tally	MT 180	Printer	21
Micom	ME726	Short Haul Modem	5
Micom	ME772	Short Haul Modem	12
Micom	M431	Short Haul Modem	21
Micom	SHM-NPR1	Short Haul Modem	5
Moore	1000	Decollator	1
MSI	85	Bar Code Reader	3
NEC	N212AR	Modem	1
Nicolet Zeta	3653SX	Drum Plotter	1
Numonics	277117	Grahpics Calculator	1
Numonics	1224	Graphics Calculator	5
Numonics	1210	Graphics Calculator	3
Numonics	1250	Graphics Calculator	7
Numonics	251	Graphics Calculator	1
Omnidata	217	Datapod Chip Reader	1
Omron	8025	CRT	8
Penril	212A	Modem	1
Penril	300/1200	Modem	1
Philips	-	Monitor,PC,Color	1
Philips	P3100-PC	PC w/1HD,1FD,Tape BU	6
Qume	S3-45	Printer	3
Racal-Vadic	VA3484G	Modem	2
Racal-Vadic	VA3484GX3	Rack Mounted Modem	6

OFFICE: Utah State Office - Inventory as of 3/86

MANUFACTURER	MODEL	ITEM DESCRIPTION	QUANTITY
Racal-Vadic	VA3455G	Modem	8
Racal-Vadic	VA1680AX	Modem Rack	1
Racal-Vadic	VA212	Modem	1
Ramtek	8130	CRT	1
Ramtek	8025	CRT	1
Sci. Rad. Corp	5014	Infrared Transmitter	1
Solana Electron	SHE822MUX	Multiplexor	2
South Hills	SHE-310	ABDE Switch	2
Starnet	601-0001	Inline Repeater	2
Stnd Register	250	Burster	1
Superior Elect.	CR7102PCU	Power Conditioner	1
Sykes	8220	Dual Disk Storage	2
Sykes	8120	Single Disk Storage	3
T-Bar	5712	Switch Box ABC	1
T-Bar	5745	Switch Box Crossover	1
T-Bar	5722	Switch Box ABC	21
Talos	8482	Digitizer	2
Tandberg	TDV 2200 S	CRT	21
Tektronix	4952	Graphic Input Device	2
Tektronix	4054	Graphics System	3
Tektronix	4907	File Manager	2
Tektronix	4014-4	Graphics Terminal	1
Tektronix	4611	Photostatic Printer	1
Tektronix	4016-1	Graphics Terminal	2
Tektronix	4662	Plotter	1
Tektronix	4631	Hard Copy Unit	2
Tektronix	4954	Digitizer	1
Televideo	950	CRT	5
Texas Instruments	Omni 800	Printer	2
Texas Instruments	745	Portable Terminal	2
Thomson	CM36512 VI	Color Monitor	1
Topaz	70303	Power Conditioner	8
Ven-Tel	MD-212-3	Modem	26
Ven-Tel	MD-201-3	Rack Mounted Modem	1
Ven-Tel	MD-201-4E	Modem	1
Ven-Tel	MD-212-2	Rack Mounted Modem	12
Ven-Tel	DS-1200-3	Modem Rack	1
Ven-Tel	MD-202-5	Rack Mounted Modem	10
Ven-Tel	MD-202-6E	Modem	10
Ven-Tel	-	Rack Mounted Modem	1
Ven-Tel	MD-212-8	Modem	4
Ven-Tel	1200-31	Modem	3
Visual	500	CRT	5
Visual	110	CRT	1

OFFICE: Utah State Office - Inventory as of 3/86

MANUFACTURER	MODEL	ITEM DESCRIPTION	QUANTITY
Wang	5974	CRT	1
Wang	2270-2	Magnetic Data	1
Wang	2200	Central Processor	1
Wang	PC-XC3	Hard Disk	1
Wang	2226A	Operator Console	1
Wang	-----	Micro-Comp	1
Wang	DW22-20	Printer	1
Wang	PC-0028-B	Micro-Comp W/Disk	1
Wang	2231W-3	Printer	1
Wang	OIS-40	WP CPU	4
Wang	OIS-060	WP CPU	2
Wang	OIS-60	WP CPU	2
Wang	OIS-50	WP CPU	2
Wang	____	WP Workstation	15
Wang	-	CRT	1
Wang	PCPM-012	Printer	1
Wang	PCPM-016	Printer	2
Wang	PM-004-B	CRT	1
Wang	Winchester	Hard Disk	1
Western Telemat	SS-8	Data Switch	1

APPENDIX B

DESCRIPTIONS OF BLM BUREAU-WIDE SYSTEMS

This appendix contains brief descriptions of the following bureau-wide systems.

Bureau-Wide Systems

System Name	System Code
Adopt-a-Horse Data System	HB
Aging of Accounts Receivable	FA
Automated Coal Lease Data System	ACLDS
Automated Federal and Indian Leaseable Minerals System	AFILMS
Automated Management by Objectives System	MBO
Aviation Contract Monitoring	AC
BLM Planning Schedule System	SS
Budget Matrix	BM
Cadastral Survey Field Note System	CS
Chargeback	CB
Checks to Treasury	FC
Corridor Environmental Impact Statement Program	EI
Data Element Dictionary	DD
Deposits-in-Transit	FD
Digital Elevation Model System	DEM
Eastern States Minerals	ESM
Eastern States Office Patent Index	ESOPI
Ecological Site Inventory	ES
Emergency Fire Fighters	EB
Financial Management Edits	FE
Financial Management Reports	FR
Financial Management Year-End Processing System	FY
Fire Cost Reports	FF
Forest Models	PM
Forest Utility Programs	PU
General Ledger System	FG
General Entry Transaction Processor System	GETP
Health Risk Appraisal Program	HR
Imprest Fund	FI
Job Documentation Reporting	JD
Lands and Minerals Case Recordation System	LMCRS
Lease Management	LM
Material Sales	MS

System Name	System Code
Minerals System 1	MS-1
Mining Claim Recordation	LT
Motor Vehicle System	MV
Operating Budget	OB
Payroll Costs	FB
Payroll/Personnel	FB/MP
Perpetual Inventory	FP
Procurement Planning and Tracking System	PR
Program Management	PG
Property Management System	PS
Public Domain Forest Inventory System	PD
Range Management Automated System	RM
Reimbursable Billing	FJ
SageRam -- Rangeland Investment Analysis Model	SR
Simultaneous Oil and Gas	SIMO
Solid Leasable Minerals System	SLMS
Special Projects	FO
Summer Hire System	SH
Suspense, Budgetary Clearing and Unearned Accounts	FS
Travel Advance System	FT
USFS Forest Inventory System	PF
Water Data Management System	WI
Waterpower System	WP
Wildlife Information System	WL
Wildfire Reporting System	FDR-AFFIRMS

Note: ACLDS and AFILMS have recently been replaced by the Solid Leasable Minerals System (SLMS).

ADOPT-A-HORSE DATA SYSTEM (HB)

This system supports the horse and burro adoption function of the Wild Horse and Burro Program. The Wild Horses and Burros Act of 1971 requires the protection, management and control of wild, free-roaming horses and burros on public lands. One technique is to put the horses and burros up for "adoption" by private owners. The Adopt-A-Horse Data System maintains data on Adopt-A-Horse applicants (e.g., name, address, phone and etc.), animals (e.g., number requested, breed, age, sex and etc.), and Private Maintenance and Care Agreement for Wild Horses and Burros (Form 4710-9) (e.g., adopter's name, address, phone, and driver's license number and animal sex, age, color and freeze mark). On request, it produces animal availability letters to applicants; title notices and title applications to adopters when eligible; and summary reports of applicants, adopters, and animals.

AGING OF ACCOUNTS RECEIVABLE (FA)

This system provides Accounts Receivable status reports for the BLM Washington Office, DSC, and State Offices for both government and non-government accounts. This system also computes interest due BLM on overdue bills and produces revised bills which include interest charges. It also generates corresponding demand (dunning) letters.

AUTOMATED COAL LEASE DATA SYSTEM (ACLDS)

This system contains coal-related geographic, geologic, economic, institutional and legal data on an ASPEN database. BLM and USGS offices update the database bi-annually. With the exception of proprietary information, the data is available for management to make policy decisions. The system supports compliance checking. Work is currently underway to merge the Automated Federal and Indian Leasable Minerals System (AFILMS) with this system. The new system will be called Solid Leasable Mineral System (SLMS) and is scheduled for implementation in the near future. The AFILMS merger could add as much as five times the data currently used by ACLDS.

AUTOMATED FEDERAL AND INDIAN LEASABLE MINERALS SYSTEM (AFILMS)

This system tracks and monitors operations concerning all solid minerals' leases, licenses, permits, applications, and contracts on public, acquired, and Indian lands. The system monitors Logical Mining Units (LMU) to assure diligent development and recovery of reserves within a prescribed timeframe. It also logs inspections of Solid Leasable Mineral leases. This system currently runs on the USGS MULTICS computer.

AUTOMATED MANAGEMENT BY OBJECTIVES SYSTEM (MBO)

This system maintains an automated, centralized file of organizational objectives information such as specific objectives, due dates, and progress milestones. It provides editing, update and retrieval capabilities as well as various on-request, hardcopy reports on request.

AVIATION CONTRACT MONITORING (AC)

The system uses input from the Organization of Aircraft Services to produce an ASPEN data base. The data base is used by the State Offices to monitor funds available on aircraft contracts and for chartering aircraft.

BLM PLANNING SCHEDULE SYSTEM (SS)

Provides the Washington Planning Office and the State Planning Offices an on-line capability for establishing and maintaining a schedule of BLM land use planning efforts. In addition, it provides for the selection of plan related reports based on user input criteria.

BUDGET MATRIX (BM)

This system provides interactive automated spreadsheet capability. It is currently used for annual and mid-year budget formulation.

CADASTRAL SURVEY FIELD NOTE SYSTEM (CS)

This system collects, edits and stores cadastral field note information, such as survey lines and monuments, and produces hardcopy reports. Field notes are the written records of public land surveys. They describe survey lines, nature of vegetation and terrain, type and size of monuments used in marking the survey, and other general features of the area (e.g., mineral occurrence, natural phenomena and etc.).

CHARGEBACK (CB)

The BLM Chargeback System produces reports by computer application which account for the cost of operation the DPS-8/70 computer facility. Costs are allocated to users based on services (time-sharing, programming, keyentry, etc..) used. A capability to recover costs will be included in the system.

CHECKS TO TREASURY (FC)

This system provides information on the services and goods received by the Bureau to the U.S. Department of Treasury. It is used to substantiate claims and authorize payments for goods/services.

CORRIDOR ENVIRONMENTAL IMPACT STATEMENT PROGRAM (EI)

This system produces tabular reports of milestone information to support Environmental Impact Statement preparation.

DATA ELEMENT DICTIONARY SYSTEM (DD)

The BLM Data Element Dictionary System is an automated, central collection point for current and complete descriptions of all BLM data elements. It contains all definitive information about these data elements, including their uses, meanings, sources, characteristics, relationships, and authorities. It contains a description of the data, not the data itself.

In addition to this dictionary feature, the system is also a data dictionary to link data elements to application systems. The dictionary function identifies what data is available.

DEPOSITS-IN-TRANSIT (FD)

This system compares BLM net total deposit and debit vouchers with those of the Department of Treasury to help reconcile differences between BLM and Treasury records.

DIGITAL ELEVATION MODEL SYSTEM (DEM)

This system maintains an inventory of over 1,800 DEM tapes on ASPEN/2 database. The database contains the location of each tape, a contact, and the coordinates and quad name of the data on the tape. It produces standard reports of the DEM tapes listed within a specific latitude and longitude, all records by quad name, and all records by geographic code.

EASTERN STATES MINERALS (ESM)

This system maintains data and produces management reports on Eastern States minerals, and total ESO acreage by county and state.

EASTERN STATES OFFICE PATENT INDEX (ESOPI)

This system maintains descriptions of land patents administered by the Eastern States Office. As original patents are committed to microfilm, descriptive information (e.g., name, patent number, legal description, microfilm roll number, image number, etc.) for each of the patents is collected and maintained by this data system. Periodically, the system produces hardcopy reference indices for ESO records personnel to locate microfilm versions of land patent records.

ECOLOGICAL SITE INVENTORY (ES)

This system processes and maintains soil and vegetation data including ground cover, erosion ratings, vegetation production, plant characteristics, and ecological condition and trend. On request, it produces reports on data such as allotment data for management alternative analysis, wildlife habitat analysis, and watershed analysis.

EMERGENCY FIRE FIGHTERS (EB)

This system maintains fire season payroll data on Emergency Fire Fighters (EFFs). EFFs are paid in the field, not through the regular pay system. It produces control reports as needed and also prints the W-2s for EFFs at year-end.

FINANCIAL MANAGEMENT EDITS (FE)

This system edits and validates financial management transactions for the Financial Management Systems (FMS). The editing system includes 21 table look-up programs to validate FMS data codes.

FINANCIAL MANAGEMENT REPORTS (FR)

This system produces monthly and year-to-date cost and income reports for Office, State and Bureau use.

FINANCIAL MANAGEMENT YEAR-END PROCESSING SYSTEM (FY)

This system closes current FY accounts, carrys certain monetary amounts forward to the new fiscal year, and accomplishes necessary code conversions for the new fiscal year master files for the Financial Management System.

FIRE COST REPORTS (FF)

This system maintains data and statistics on range and forest fires, and produces periodical reports on fire-related costs by Bureau, state, or office.

FOREST MODELS (PM)

This system is a forest modeling system which consists of two models: Allowable Cut Simulation (SIMIX) and Timber Stand Projection (PROGNOSIS). SIMIX is a harvesting simulation model used to determine a harvest level (allowable cut) which is sustainable for the time period of interest. PROGNOSIS projects growth and yields of individual timber standards in the Northern Rocky Mountains. It allows simulation of short and long range land and timber strategies.

FOREST UTILITY PROGRAMS (PU)

These six programs were either developed for Forestry or used primarily by Forestry. They are maintained by Forestry funding.

1. IVST produces cost/benefit, present net worth, and internal rate of return reports. These examine long range investment opportunities for forestry and other natural resource alternative management strategies.

2. The Polynomial Regression Program produces straight line or curved line function and generates equations.

3. The Stepwise Regression allows users to statistically analyze the variable attributes of up to 2000 field samples. The correlation coefficients of up to 80 variables can be tested.

4. The STRAT program tests the results of a stratified random sampling procedure (originally developed for Ecological Site Inventories).

5. The HISTO program produces a horizontal histogram on any data file.

6. The Cost/Benefit program tests short and long range investment opportunities.

GENERAL LEDGER SYSTEM (FG)

This system provides DSC and the Washington Office with periodic General Ledger and Working Capital Fund summaries and reports.

GENERAL ENTRY TRANSACTION PROCESSOR SYSTEM (GETP)

This system stores user data on-line and interfaces with the Honeywell Transaction Processing System (TP). It can accommodate up to 10 separate applications. The individual user may tailor TP driven screens to support specific application data input.

This system provides on-line data storage for up to 7 days, a file transfer facility for batch update processing, and date and time stamps for each record entered.

HEALTH RISK APPRAISAL PROGRAM (HR)

This system provides Bureau employees with information to improve their personal health and life expectancy based on responses to a confidential questionnaire.

IMPREST FUND (FI)

This system reports changes in imprest fund balances and produces an annual review report of each imprest fund. These reports are used to ensure a proper turnover rate on each imprest fund.

JOB DOCUMENTATION REPORTING (JD)

This system provides a uniform method for documenting and entering jobs into the Bureau's Annual Work Plan (AWP). It periodically produces reports on the inventory of jobs, current job status, progress, and maintenance schedules.

LANDS AND MINERALS CASE RECORDATION SYSTEM (LMCRS)

This system provides automated case recording and tracking information including land description, proprietor records, action codes, action dates, accounting data, and acreage. It produces serial index, case aging, and case leasing reports. This system was formerly called the Automated Land and Minerals Record System (ALMRS), Phase I.

LEASE MANAGEMENT (LM)

This system maintains data on leases for lands use cases (airports, grazing, right of ways, recreation and etc.) on public lands. It produces billings, receipts, and management reports for BLM district offices.

MATERIAL SALES (MS)

This system processes and maintains data on timber, vegetal and mineral disposals (includes sales and free use authorizations). It records volumes, products, financial data, and user identification information and produces periodic monthly, quarterly and annual management reports for State Offices and the Bureau's Washington Office. Statistical reports are produced at the end of each fiscal year for inclusion in Congressional Reports.

MINERALS SYSTEM 1 (MS-1)

This system is a data collection, storage and retrieval system designed to process lease inspection, well, facility and Incidence of Non-Compliance data for onshore fluid leaseable minerals. It also maintains a lease and well inventory.

MINING CLAIM AND RECORDATION (LT)

This system provides timely information on Mining Claims located within the jurisdiction of the ten BLM administrative states. It is a DMIV database system, accessed and updated via the DMIV Transaction Processor. It produces cyclic reports including the Mining Claim Index and wilderness study report.

MOTOR VEHICLE SYSTEM (AM)

This system maintains accounting and utilization data on BLM-assigned motor vehicles. It produces periodic management reports on vehicle cost and use.

OPERATING BUDGET (OB)

This system provides monthly year-to-date reports on current labor cost and operations plan status. It summarizes information at the Bureau, State Office, and District Office level.

PAYROLL COSTS (FB)

This system provides year-to-date information on payroll costs. It collates and edits payroll cost data into the Financial Management System format.

PAYROLL/PERSONNEL (FB/MP)

This system handles bi-weekly Time/Attendance data. It produces a report of control totals used by the Payroll Section to verify payroll accuracy. It edits, balances, and reformats T&A records and writes valid T&A transactions to magnetic tape for input to the PAY/PERS Payroll System at the Bureau of Reclamation.

This system also receives output data from PAY/PERS bi-weekly in the form of three files--the MSTFIL (Paymaster), the POSNMST (Position Master), and the COSTFIL (bi-weekly labor cost file). Using these files, the system creates a combined Pay/Position Master (consisting of fewer data elements) and a Labor Cost File. The system uses these files to produce reports for the Payroll Section and the Division of Personnel Services and also provides pay and cost data to the Financial Management System.

PERPETUAL INVENTORY (FP)

This system maintains an on-going inventory of the Bureau's payable accounts and financial obligations.

PROCUREMENT PLANNING AND TRACKING SYSTEM (PR)

This system provides procurement planning and tracking support for all procurements over $10,000 handled by the Denver Service Center, the Oregon State Office, and the Washington Office.

PROGRAM MANAGEMENT (PG)

This system maintains descriptive and fiscal information on the BLM property inventory. It produces periodic management reports for the DSC Property Management Office.

PROPERTY MANGEMENT SYSTEM (PS)

Maintains an accurate personal property inventory with costs that balance to the general ledger account. Provides inventory lists upon request and on-line access to property data by field offices. Inventory is updated daily by field offices and the Service Center. Allows local property personnel to control the location of property within their offices. Various selection reports from the inventory are produced for the Service Center, State Offices, Field Offices and the Washington Office. Finance updates and Property Audit Reports are produced to monitor the General Ledger balances. Statistical Age Analysis and Detailed Age Analysis reports are generated for all access levels. Disposal Tracking Reports are generated for all levels and a Capitalized Class Analysis Report is generated for use at the Service Center. Quarterly and annual reports are produced for Finance and Property Management.

PUBLIC DOMAIN FOREST INVENTORY SYSTEM (PD)

This system consists of three major subsystems, each serving different users and purposes.

1. The Extensive Inventory subsystem performs edits, computes individual tree measurements, and produces reports on extensive forest inventory data collected between 1971 and 1976.

2. The Individual Tree Data Computational subsystem consists of two parts:

   a) The BLM Tree Data Computational subsystem edits, computes, and generates tabular and graphic reports on specific tree data to support formulation of intensive forest management programs on site specific areas. Although data enters the system through key entry, the system is designed to be operated by field users through timesharing. This system is used principally for BLM commercial forest lands.

   b) The Nevada Tree Data subsystem consists of three interactive programs which allow field personnel to load, edit and selectively output data on specific tree stands. The system is primarily designed for the pinon-juniper woodlands of Utah and Nevada.

3. The Stand Summary subsystem edits and stores data from several types of stands (not limited to timber). Stand data is updated as the forest ages or land use changes. The ASPEN/2 system is used on the Stand Summary subsystem data to produce consolidation and data summary reports.

RANGE MANAGEMENT AUTOMATED SYSTEM (RM)

This system maintains descriptive, planned use, and fee collection data for grazing leases on public lands. It maintains a current year operating file and current and past year statistical files. It produces periodic administrative support and management reports (including billings information).

REIMBURSABLE BILLING (FJ)

This system provides an automated means of billing federal agencies and the public for reimbursable services provided by BLM. It also notifies State offices of projects that have been over obligated. It also provides a SIBAC interface with other agencies.

SAGERAM - RANGELAND INVESTMENT ANALYSIS MODEL (SR)

This system is an analytical model for intergrating efficiency considerations in the design of rangeland investment proposals and to measure relative economic efficiency criteria of investment proposals in a standard and repeatable manner. It is used to prepare and schedule budget requests and monitor the progress of range improvements. It was designed to meet the requirements of components number 2 and 3 of the BLM Rangeland Improvement Policy.

SIMULTANEOUS OIL AND GAS (SIMO)

This system provides State Offices with data capture and processing of Simultaneous Oil and Gas Lease Applications. The system provides drawing results, refunding, and other administrative reports to support the bi-monthly simultaneous oil and gas drawings.

SOLID LEASABLE MINERALS SYSTEM (SLMS)

An analytical soil-leasing system running on the USGS Multics.

SPECIAL PROJECTS (FO)

This system provides cost reports for selected projects and subactivities (e.g., Rights-of-Way and conveyance of Federally-owned Mineral Estates).

SUMMER HIRE SYSTEM (SH)

This system processes applications for summer hire for the Division of Personnel Services. The system produces state personnel rosters, edit lists, and letters to the applicants.

SUSPENSE, BUDGETARY CLEARING AND UNEARNED ACCOUNTS (FS)

This system Ages funds deposited in the Suspense, Budgetary Clearing, and Unearned accounts to ensure they are either transferred for government use or returned to the payer.

TRAVEL ADVANCE SYSTEM (FT)

This system provides the DSC Division of Financial Operations and State Offices with BLM and other agency (using BLM funds) travel advance fund status reports.

USFS FOREST INVENTORY SYSTEM (PF)

This system consists of two sub-systems: Edit-2; and Table-2 and Output-2. Edit-2 is used to edit resource inventory data. It permits the user to designate special functions for editing and computation purposes. Table-2 and Output-2 loads large amounts of inventory data into tables and produces statistical analyses of these tables.

WATER DATA MANAGEMENT SYSTEM (WI)

The system provides for input, storage, updating, tracking and retrieval of information pertaining to water sources, uses, rights and requirements. Data is stored in ASPEN/2 data bases by State with screens and routines to facilitate input and retrieval. Several programs aid users in loading large volumes of data.

WATERPOWER SYSTEM (WP)

The system provides the experienced professional with programs and data access to assist in the identification and evaluation of potential water storage and hydro-electic sites. The system utilizes direct access to the Geological Survey's NARDEX & WATSTOR and includes the Hydrologic Engineering Center's HEC4, HEC5, RESERVOIR YIELD and HYDUR Programs. The system is designed primarily for the use of the BLM's Waterpower Staff and includes an inventory of Powersite Classifications, Powersite Reserves, Waterpower Designations and Reservoir Site Reserves.

WILDLIFE INFORMATION SYSTEM (WL)

This system integrates and organizes wildlife habitat data for use in considering wildlife in the Bureau's planning and decision making process. The present capabilities cover terrestrial species only. It provides editing and storage of field collected data and produces a variety of "standard reports" for use by management. The ASPEN software package is used to accommodate "non-standard queries." The system provides data about habitat sites and the species that use the area. It groups wildlife species data together by niches or guilds occupied. The Site Write-up Area (SWA) or Habitat Site basic mapping unit is used so vegetative data on the same site can be obtained from Ecological Site Inventories. Habitat sites with biological commonalities are stratified and characterized into standard habitat sites. The system provides data interchange with other classification systems of Federal, State and private organizations.

WILDFIRE REPORTING SYSTEM (FDR-AFFIRMS)

This system collects, edits and stores fire control and location, date and total fire damage data for statistical reporting and analysis. The data is maintained in a master file for each calendar year.

APPENDIX C

NETWORK SCHEMATICS

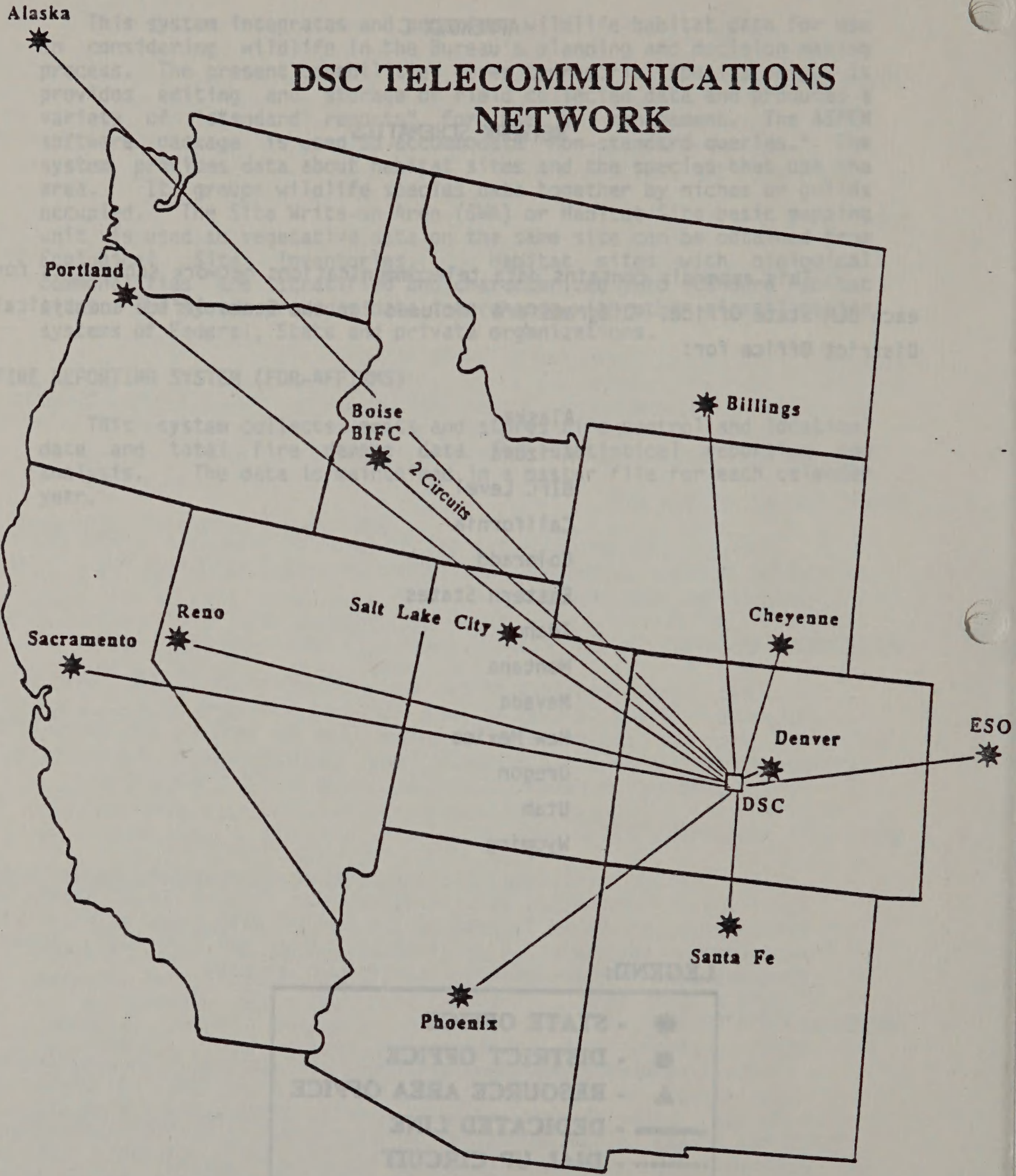
This appendix contains data telecommunications network schematics for each BLM State Office. Diagrams are included for the State Office and typical District Office for:

- Alaska
- Arizona
- BIFC Level 6
- California
- Colorado
- Eastern States
- Idaho
- Montana
- Nevada
- New Mexico
- Oregon
- Utah
- Wyoming

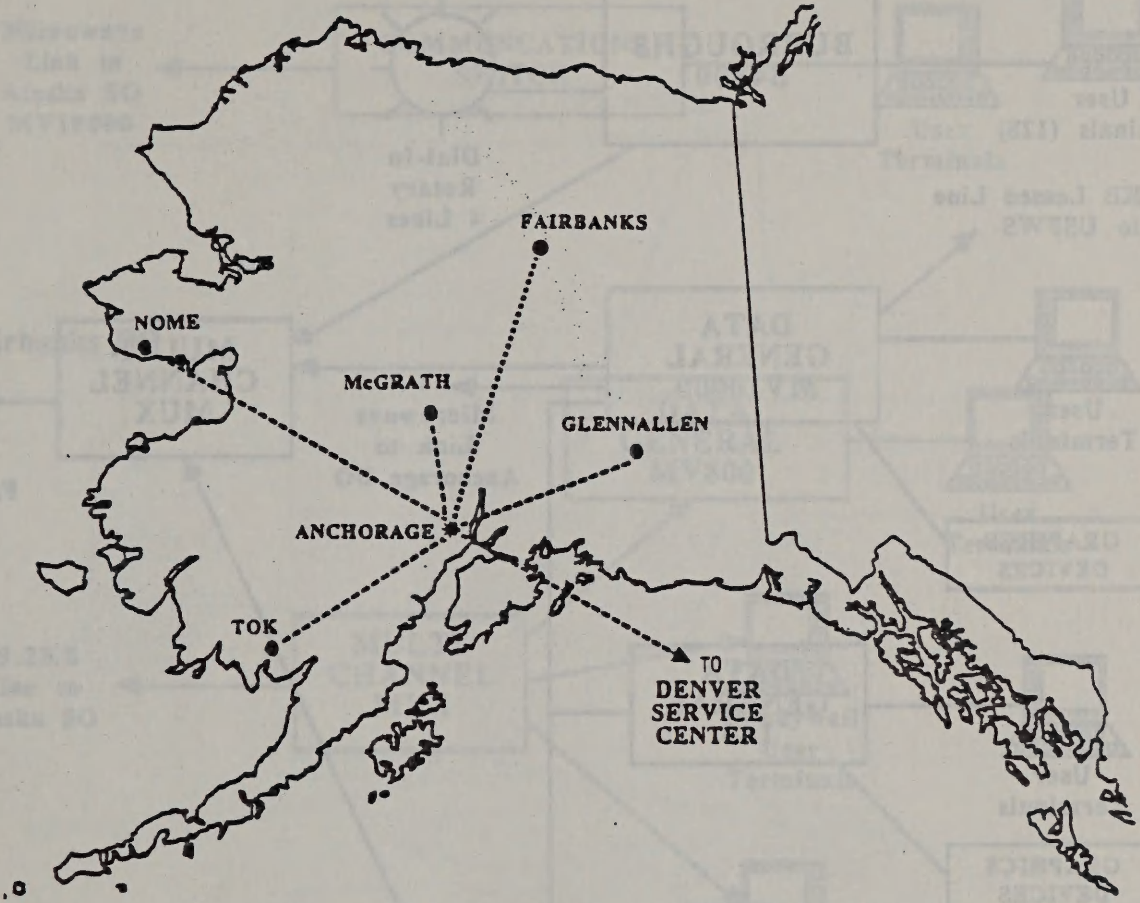
LEGEND:

✸ - STATE OFFICE
● - DISTRICT OFFICE
▲ - RESOURCE AREA OFFICE
—— - DEDICATED LINE
.... - DIAL-UP CIRCUIT

DSC TELECOMMUNICATIONS NETWORK



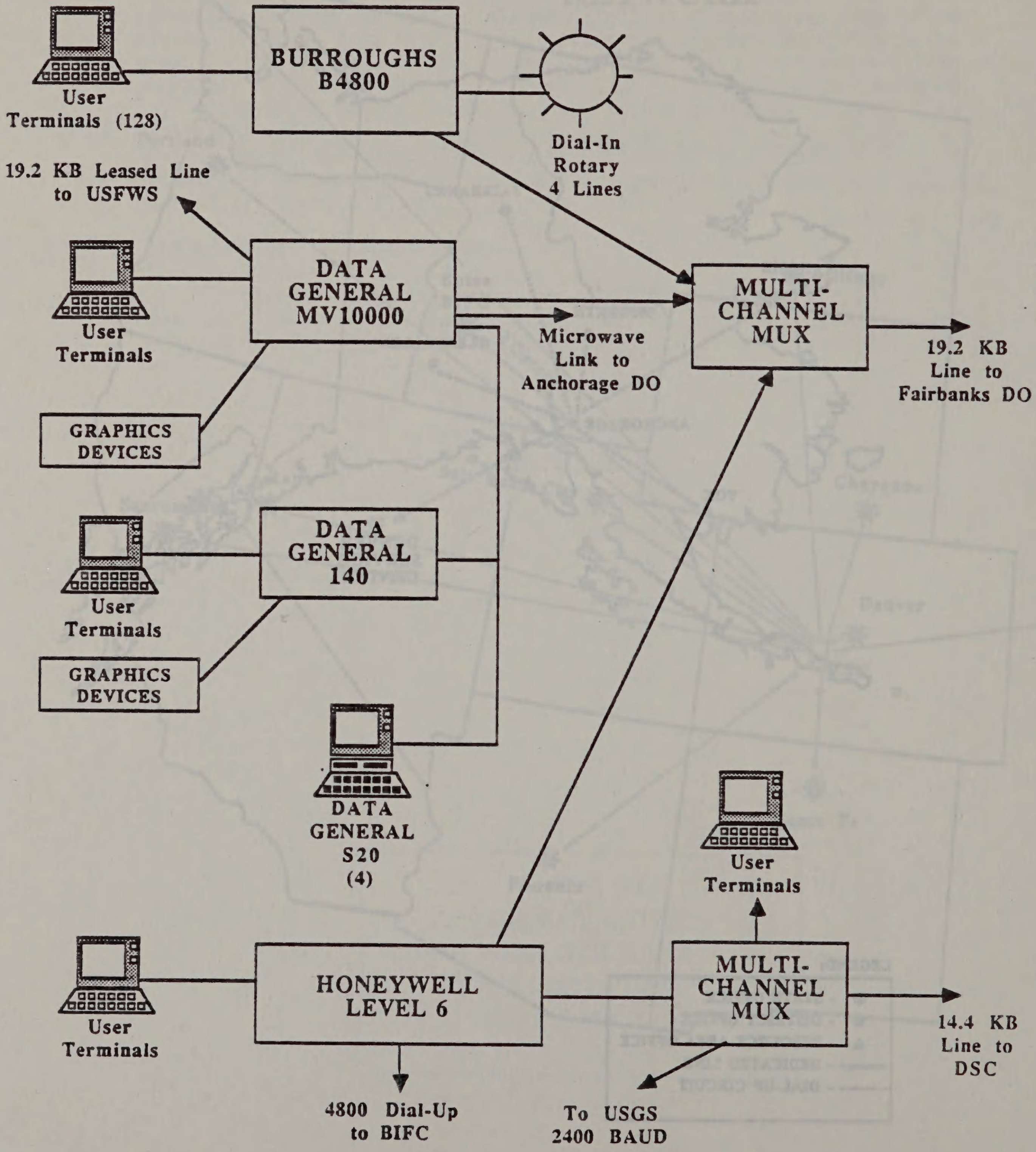
ALASKA STATE OFFICE NETWORK



LEGEND:

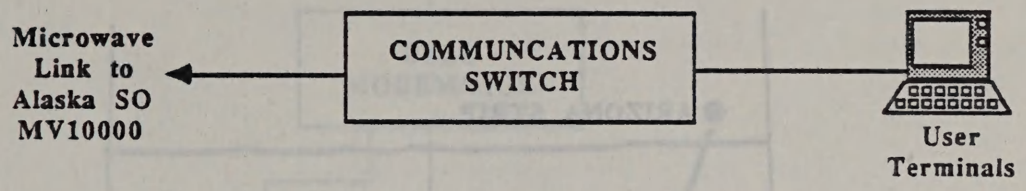
- ✸ - STATE OFFICE
- ● - DISTRICT OFFICE
- ▲ - RESOURCE AREA OFFICE
- ——— - DEDICATED LINE
- ········ - DIAL-UP CIRCUIT

ALASKA STATE OFFICE

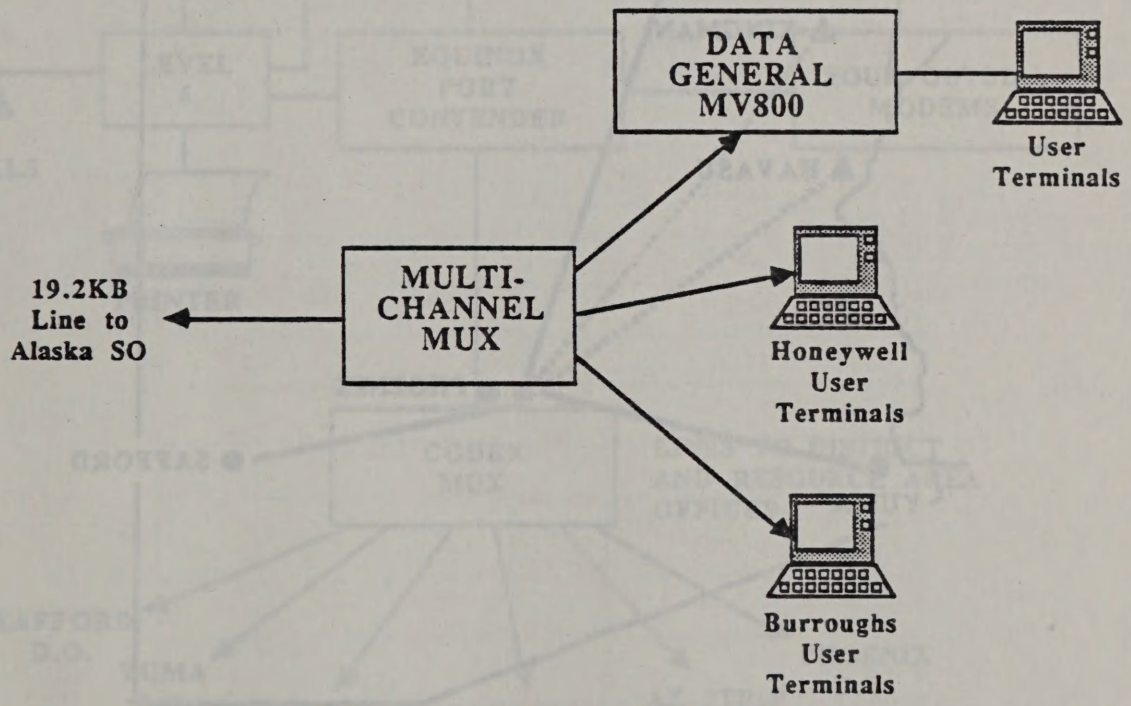


ALASKA FIELD OFFICES

Anchorage DO

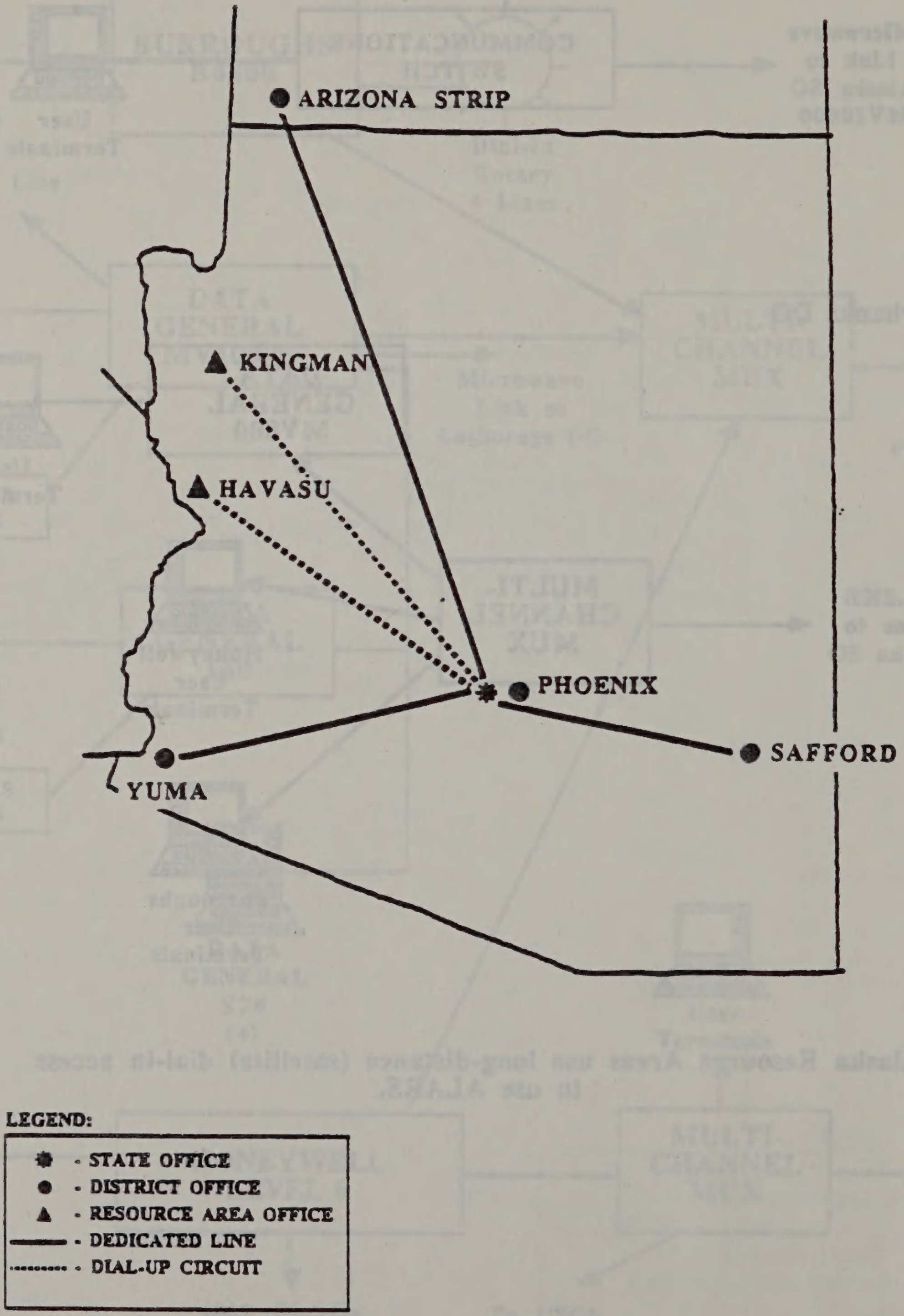


Fairbanks DO

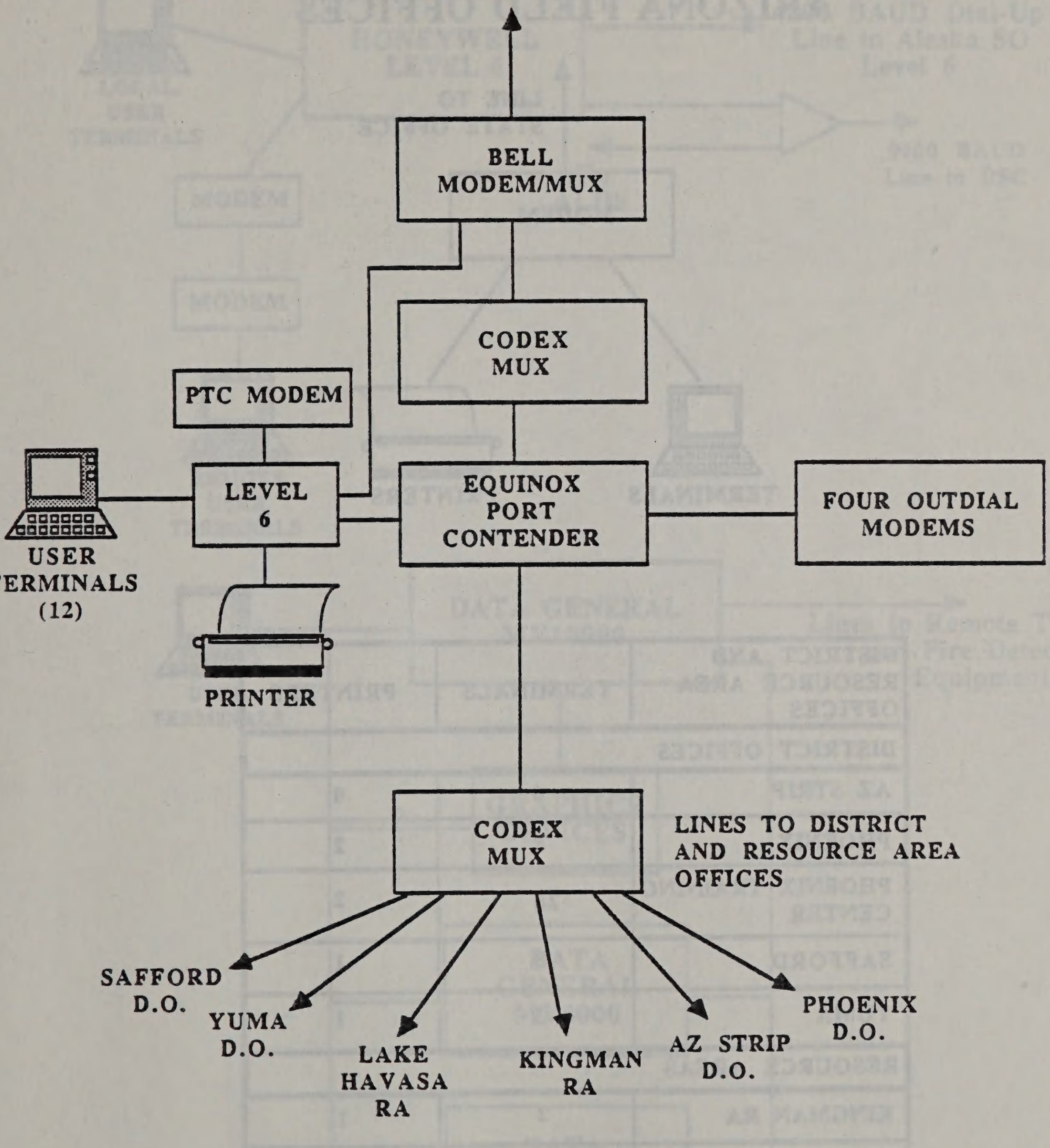


Alaska Resource Areas use long-distance (satellite) dial-in access to use ALARS.

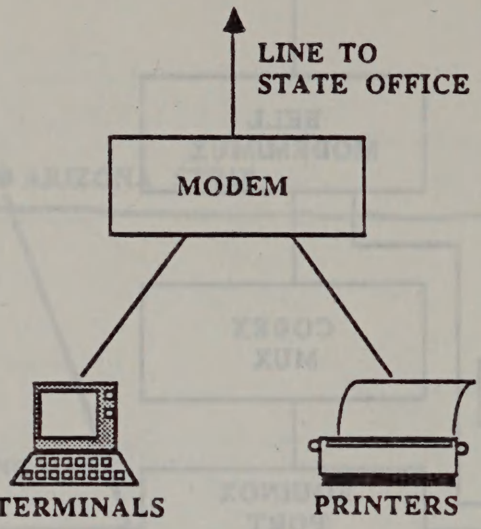
ARIZONA STATE OFFICE NETWORK



ARIZONA STATE OFFICE

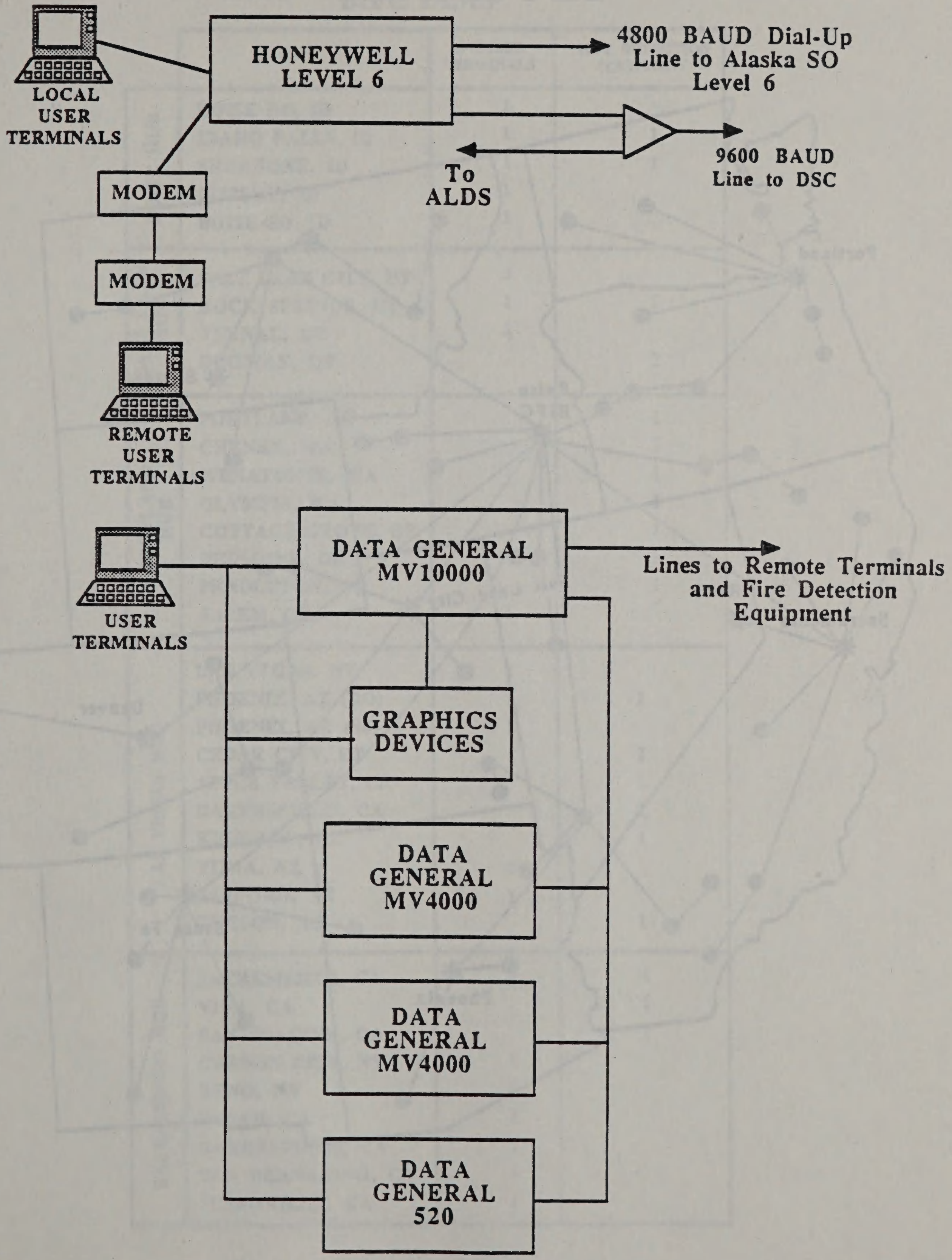


ARIZONA FIELD OFFICES

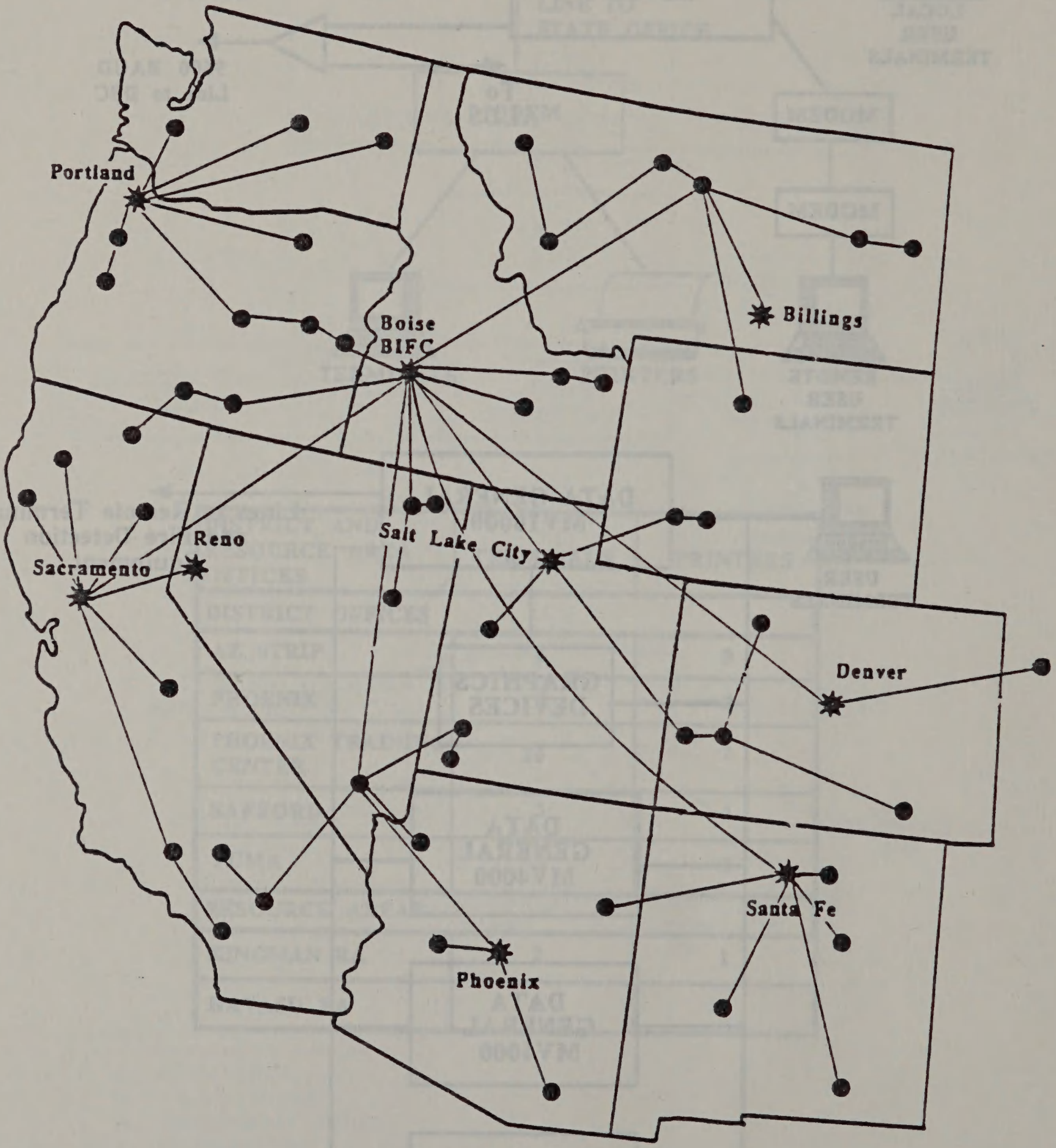


DISTRICT AND RESOURCE AREA OFFICES	TERMINALS	PRINTERS
DISTRICT OFFICES		
AZ STRIP	6	0
PHOENIX	6	2
PHOENIX TRAINING CENTER	26	2
SAFFORD	3	1
YUMA	3	1
RESOURCE AREAS		
KINGMAN RA	2	1
HAVASU RA	2	1

BIFC


LOCAL USER TERMINALS
HONEYWELL LEVEL 6
4800 BAUD Dial-Up Line to Alaska SO Level 6
9600 BAUD Line to DSC
To ALDS
MODEM
MODEM
REMOTE USER TERMINALS
USER TERMINALS
DATA GENERAL MV10000
Lines to Remote Terminals and Fire Detection Equipment
GRAPHICS DEVICES
DATA GENERAL MV4000
DATA GENERAL MV4000
DATA GENERAL 520

BIFC FIRE NETWORK



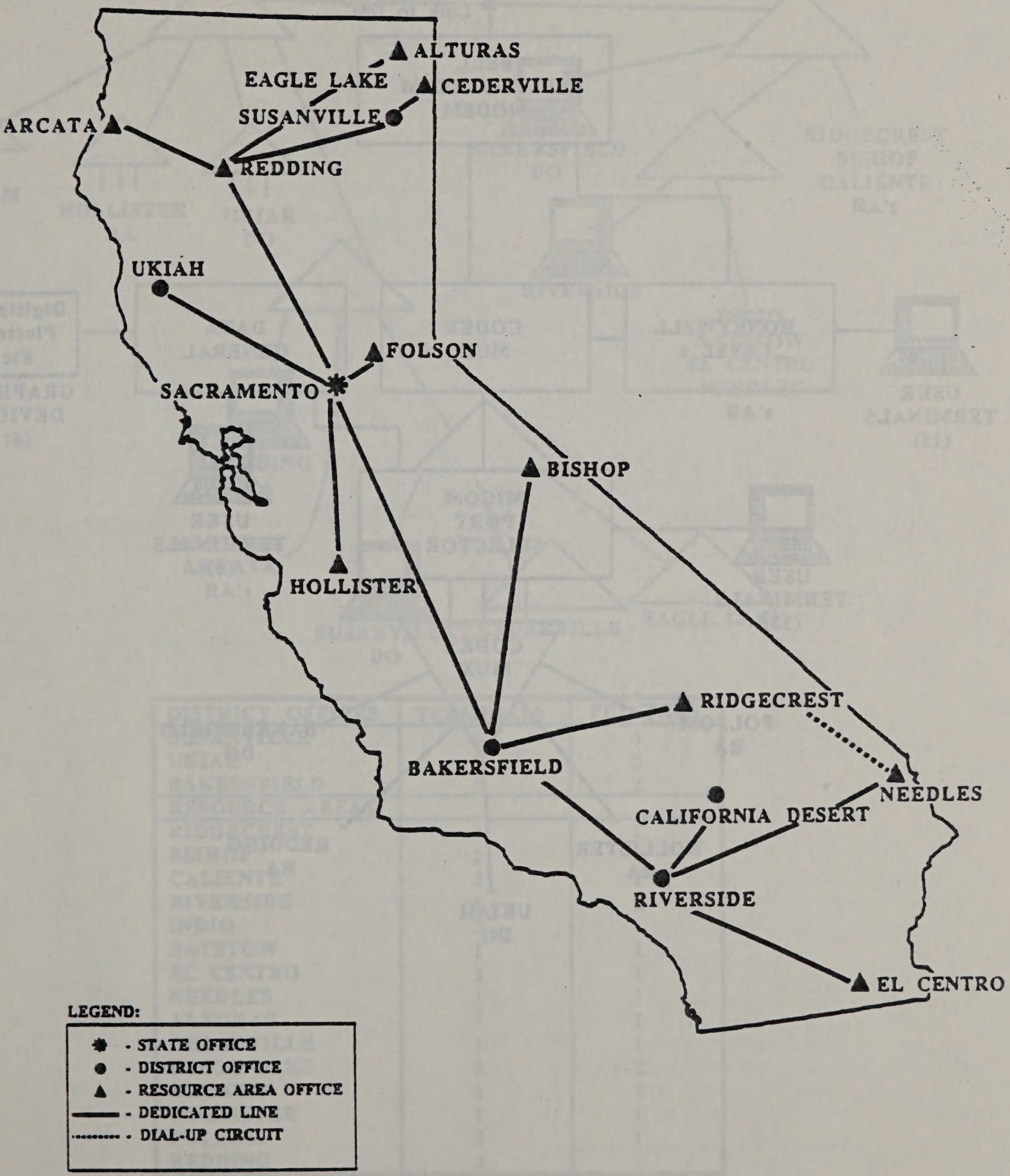
BIFC IAMS

	CITY	NUMBER TERMINALS	FIRE DETECTION EQUIPMENT
BOISE HUB	BOISE DO, ID	1	
	IDAHO FALLS, ID	1	1
	SHOSHONE, ID	1	1
	BURLEY, ID	1	
	BOISE SO, ID	1	
SALT LAKE HUB	SALT LAKE CITY, UT	3	
	ROCK SPRINGS, UT	1	1
	VERNAL, UT	1	
	DUGWAY, UT		2
PORTLAND HUB	PORTLAND, OR		1
	CHENEY, WA		1
	WENATCHEE, WA		1
	OLYMPIA, WA		1
	COTTAGE GROVE, OR		1
	REDMOND, OR		1
	PENDLETON, OR		1
	SALEM, OR	1	
LAS VEGAS HUB	LAS VEGAS, NV	1	
	PHOENIX, AZ (DO)	1	1
	PHOENIX, AZ (S0)	1	
	CEDAR CITY, UT	1	2
	APPLE VALLEY, CA		1
	BAKERSFIELD, CA		1
	KINGMAN, AZ		1
	YUMA, AZ	1	
	SAFFORD, AZ	1	
	TUCSON, AZ		1
SACRAMENTO HUB	SACREMENTO, CA	1	1
	VINA, CA		1
	SAN JOAQUIN, CA		1
	CARSON CITY, NV	1	
	RENO, NV	1	
	UKIAH, CA	1	
	BAKERSFIELD, CA	1	
	SAN BERNADINO, CA	1	
	SUSANVILLE, CA	1	

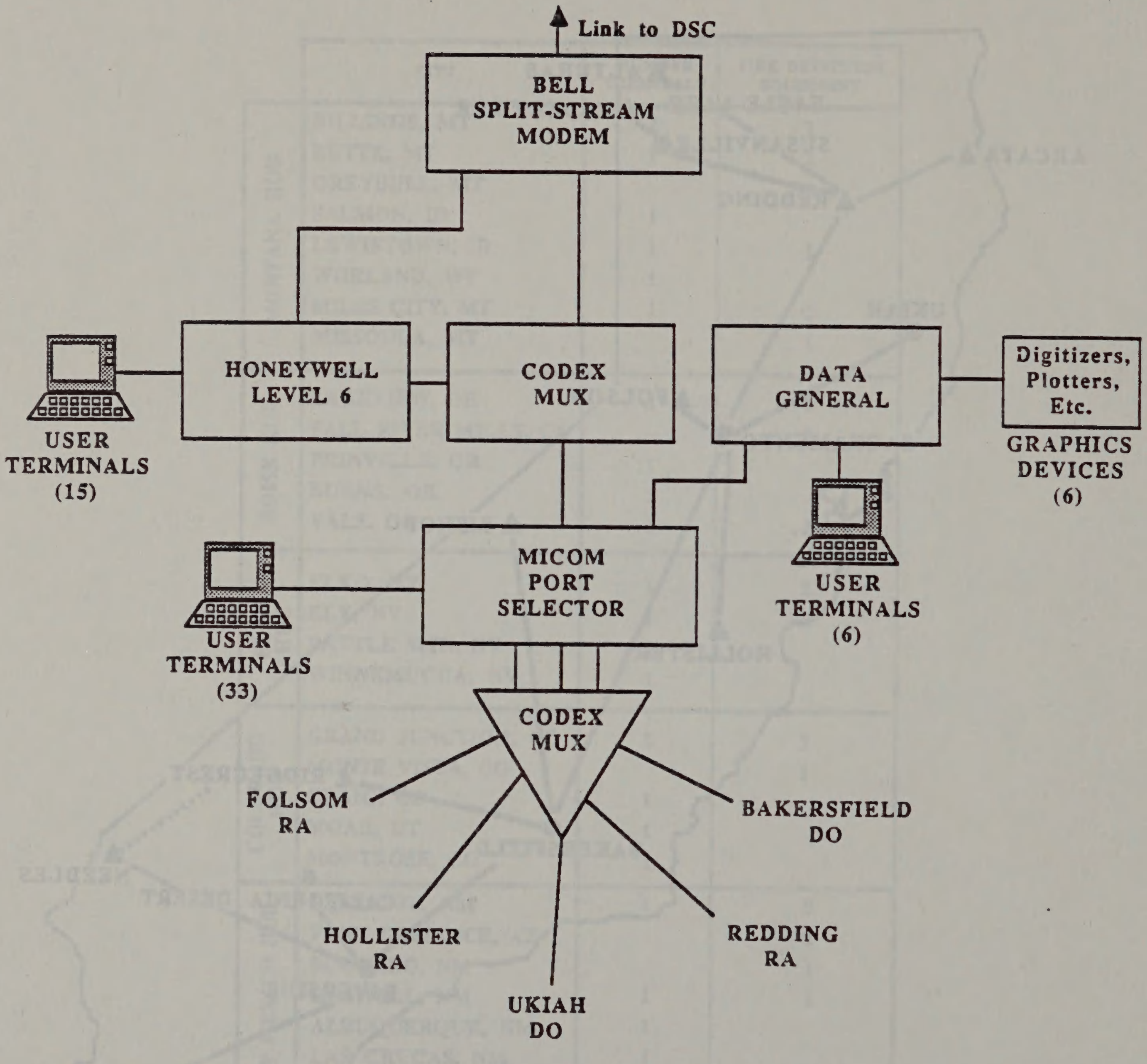
BIFC IAMS (Cont.)

	CITY	NUMBER TERMINALS	FIRE DETECTION EQUIPMENT
MONTANA HUB	BILLINGS, MT	2	1
	BUTTE, MT	1	2
	GREYBULL, MT		1
	SALMON, ID	1	
	LEWISTOWN, ID	1	1
	WORLAND, WY	1	
	MILES CITY, MT	1	2
	MISSOULA, MT		1
BOISE HUB	LAKEVIEW, OR	1	1
	FALL RIVER MILLS, CA		1
	PRINVILLE, OR	1	
	BURNS, OR	1	
	VALE, OR	1	2
ELKO HUB	ELKO, NV	1	2
	ELY, NV	1	1
	BATTLE MTN, NV	1	
	WINNEMUCCA, NV	1	
COLORADO HUB	GRAND JUNCTION, CO	1	2
	MONTE VISTA, CO		1
	CRAIG, CO	1	
	MOAB, UT	1	
	MONTROSE, CO	1	
NEW MEXICO HUB	SANTA FE, NM	1	2
	FORT DEFIANCE, AZ		1
	SOCORRO, NM		1
	ROSWELL, NM	1	1
	ALBUQUERQUE, NM	1	
	LAS CRUCAS, NM	1	
	DENVER, CO	1	
DSC HUB	WASHINGTON, DC	1	
	CHEYENNE, WY	1	
	CASPER, WY	1	
	RAWLINS, WY	1	

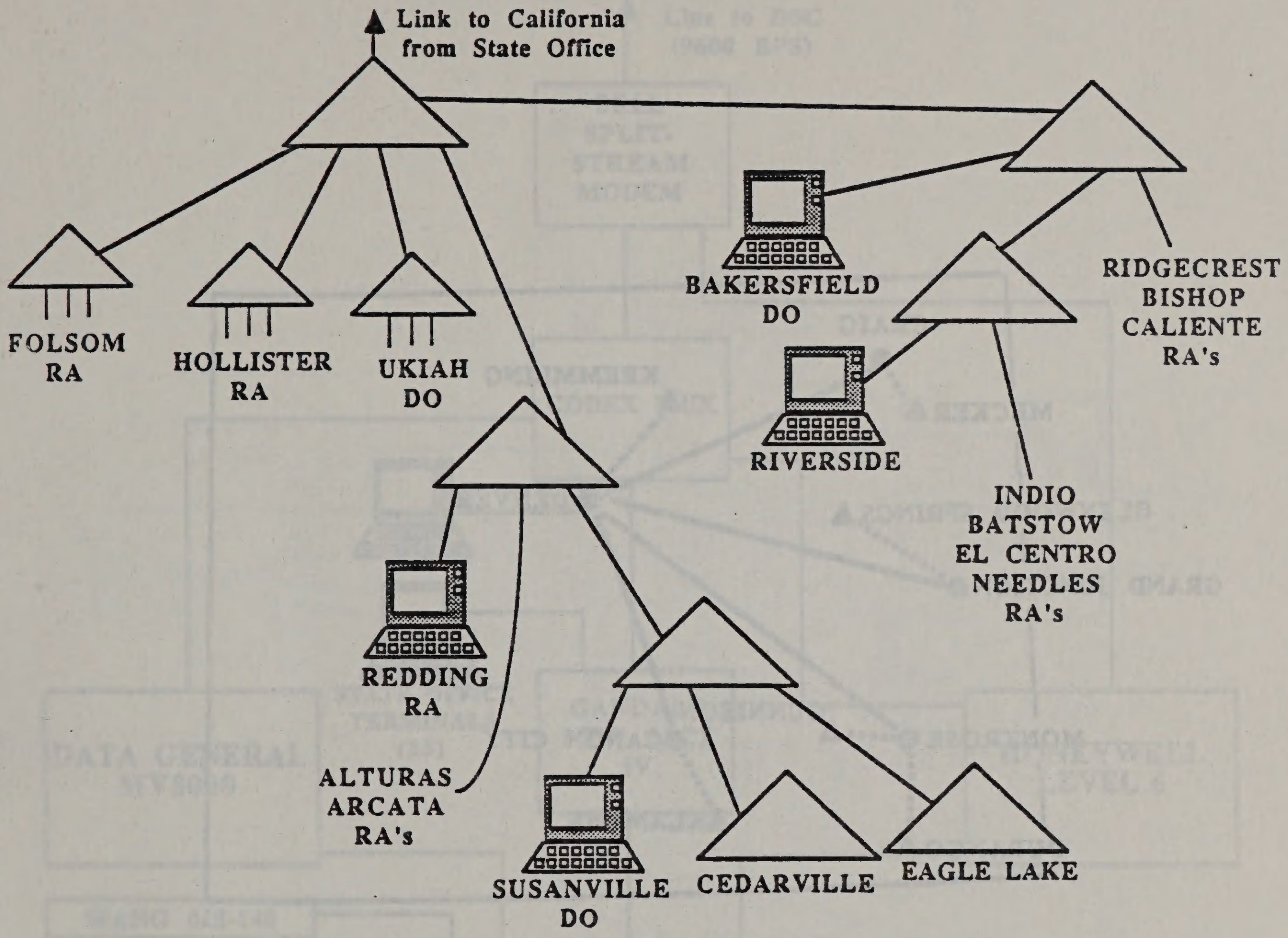
CALIFORNIA STATE OFFICE NETWORK



CALIFORNIA STATE OFFICE

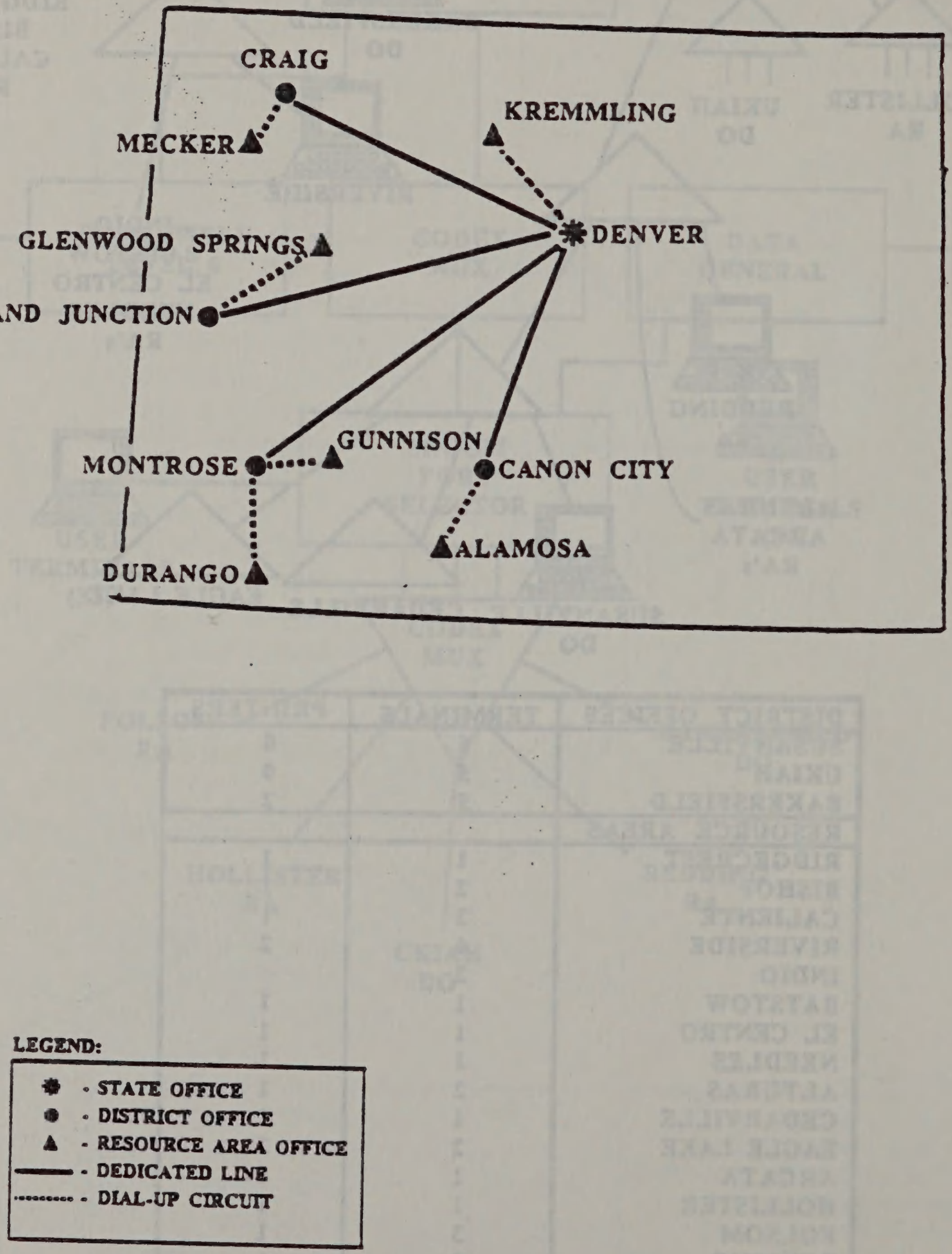


CALIFORNIA DISTRICT AND RESOURCE AREA OFFICES

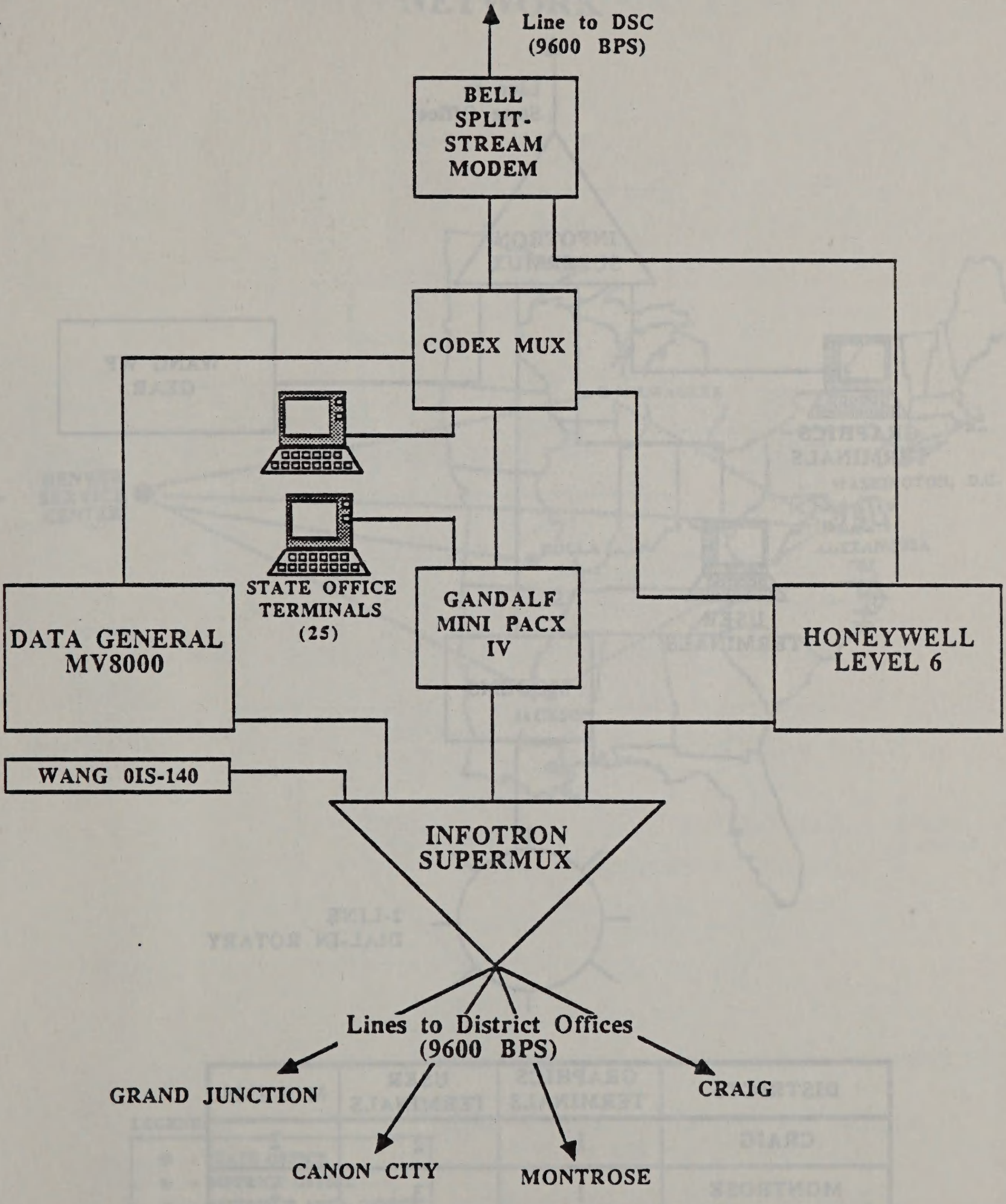


DISTRICT OFFICES	TERMINALS	PRINTERS
SUSANVILLE	6	0
UKIAH	5	0
BAKERSFIELD	5	2
RESOURCE AREAS		
RIDGECREST	1	1
BISHOP	2	1
CALIENTE	2	1
RIVERSIDE	6	2
INDIO	2	
BATSTOW	1	1
EL CENTRO	1	1
NEEDLES	1	1
ALTURAS	2	1
CEDARVILLE	1	1
EAGLE LAKE	2	2
ARCATA	1	1
HOLLISTER	1	1
FOLSOM	3	1
REDDING	2	1

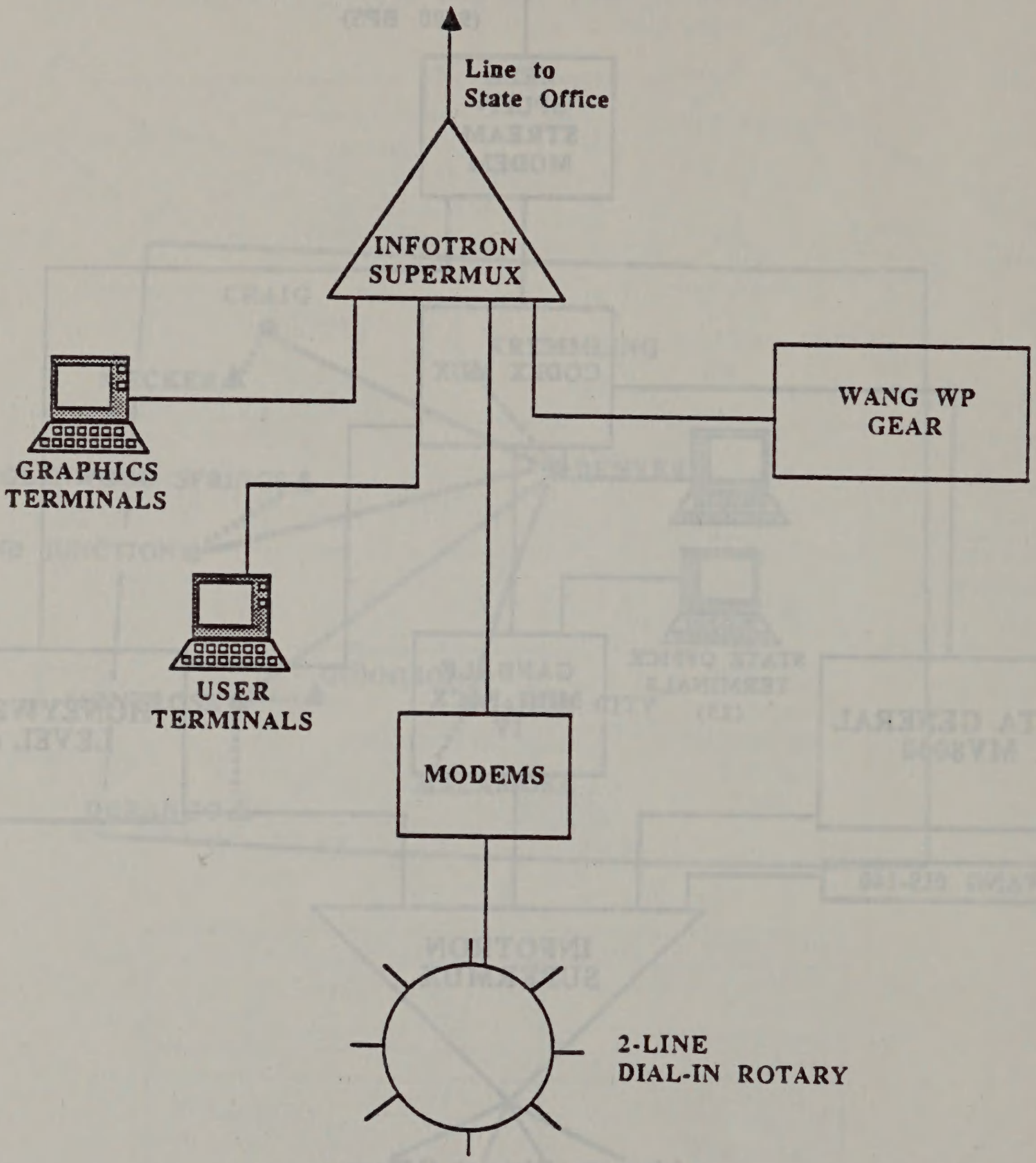
COLORADO STATE OFFICE NETWORK



COLORADO STATE OFFICE

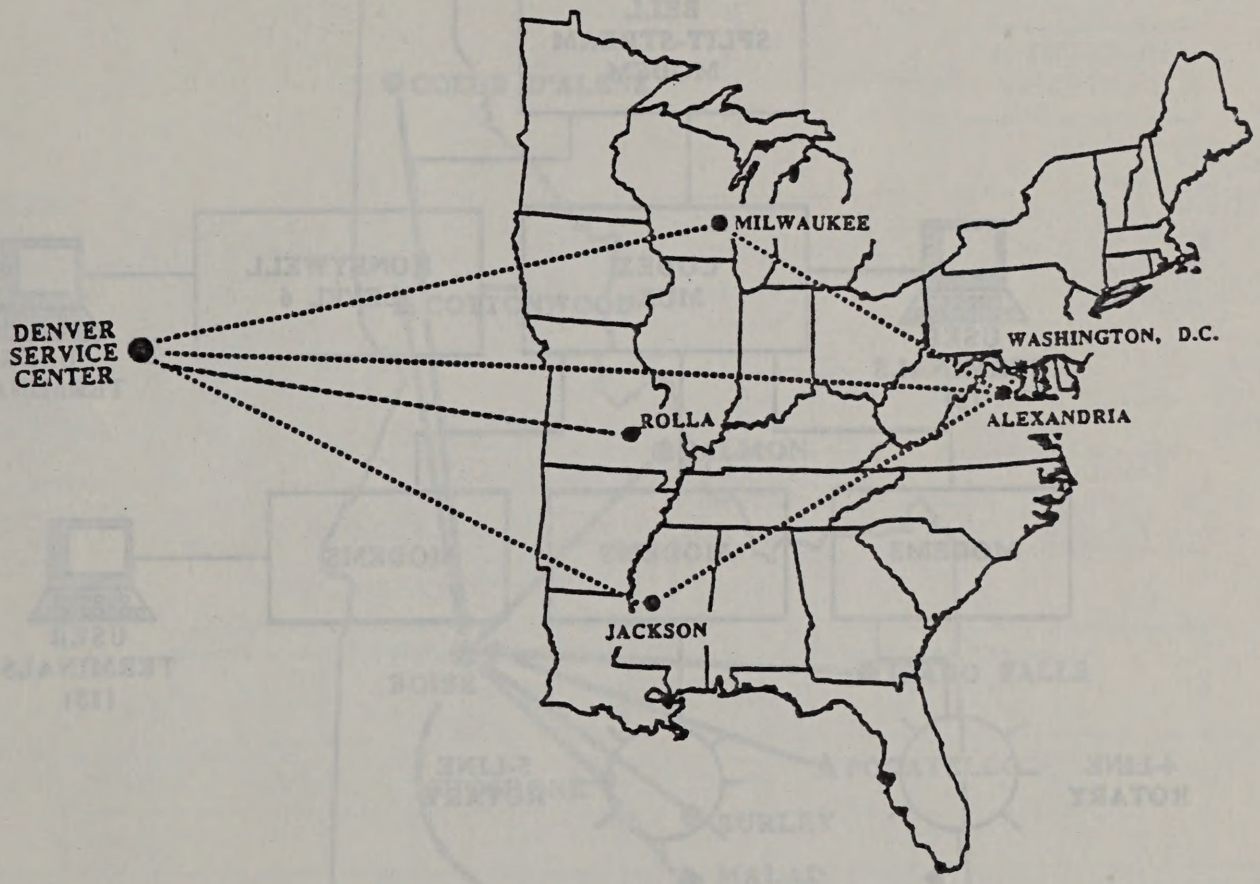


COLORADO DISTRICT OFFICES



DISTRICTS	GRAPHICS TERMINALS	USER TERMINALS	MODEMS
CRAIG	1	2	2
MONTROSE	1	3	2
CANON CITY	1	3	2
GRAND JUNCTION	1	4	2

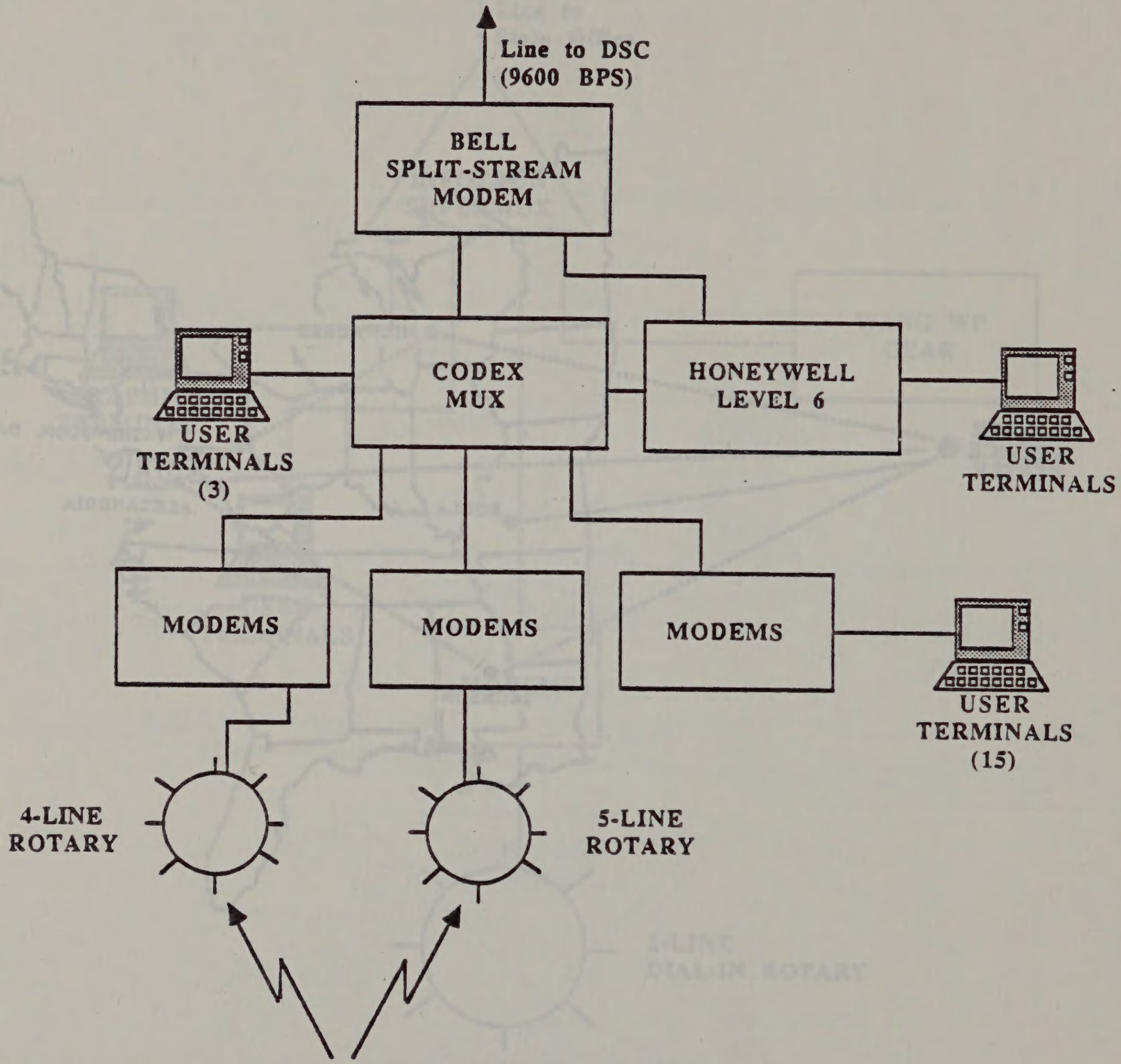
EASTERN STATES OFFICE NETWORK



LEGEND:

- ✸ - STATE OFFICE
- ● - DISTRICT OFFICE
- ▲ - RESOURCE AREA OFFICE
- —— - DEDICATED LINE
- ········ - DIAL-UP CIRCUIT

EASTERN STATES OFFICE

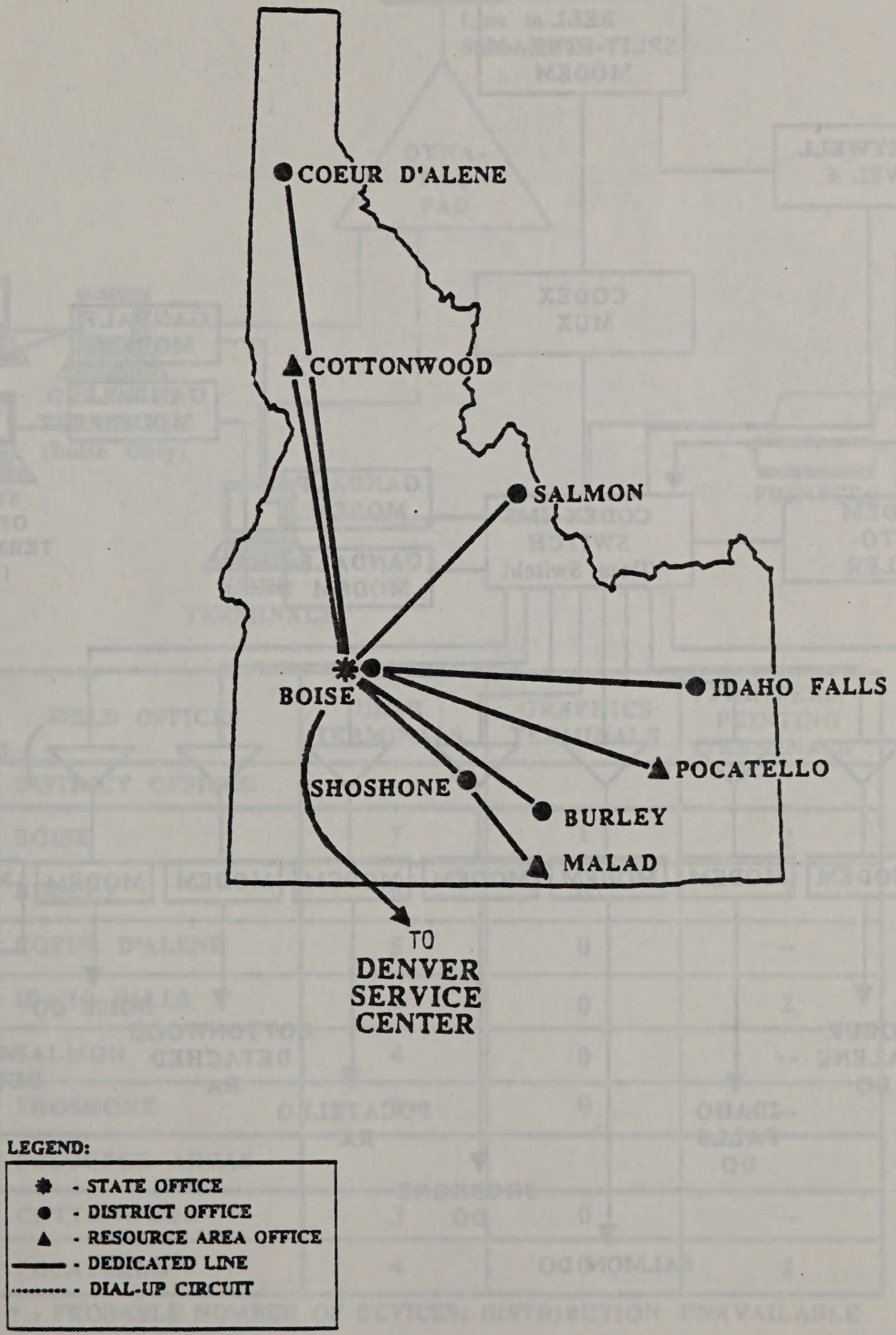


DIAL-IN FROM ESO (LOCAL USERS), AND WASHINGTON OFFICE

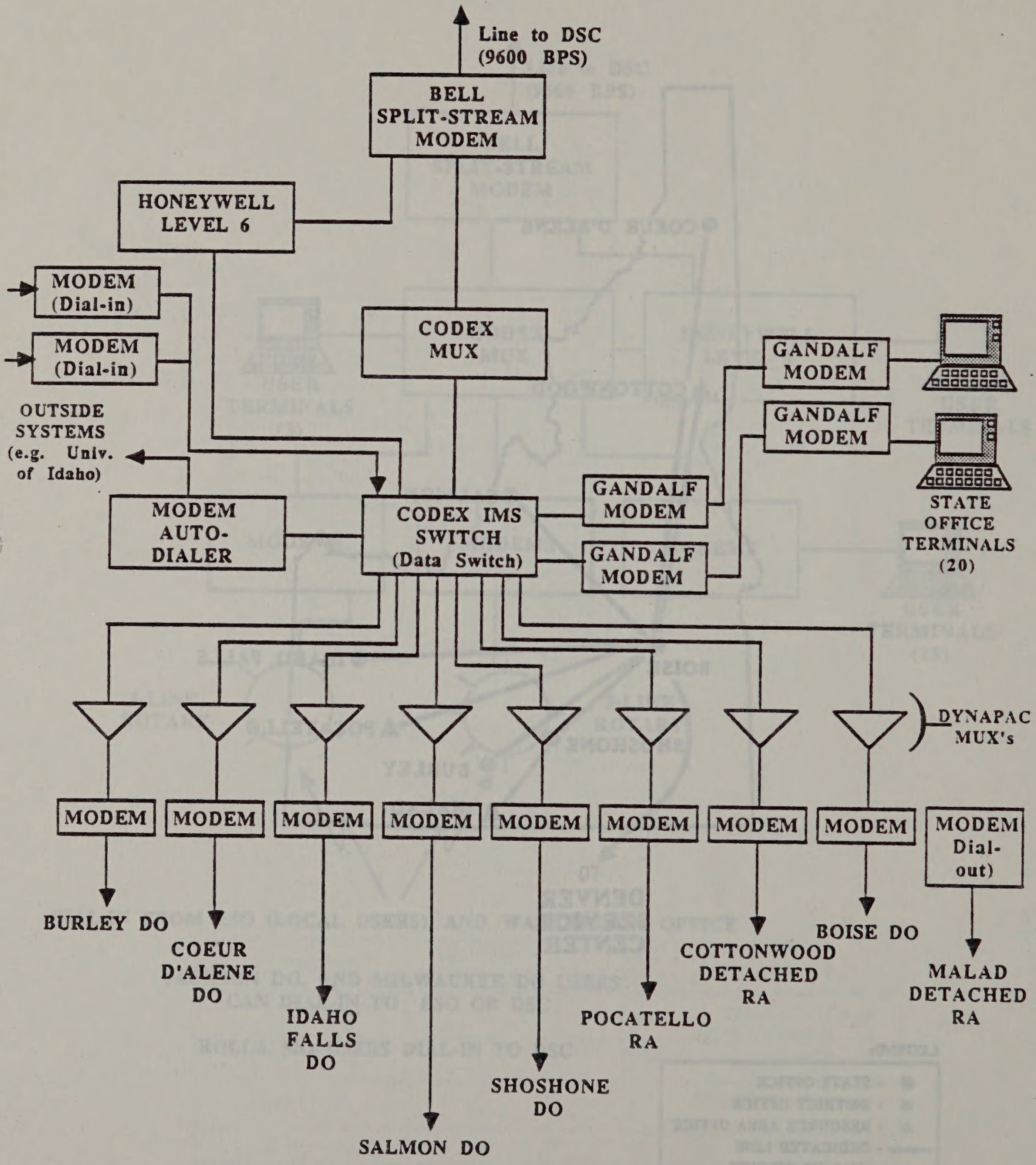
JACKSON DO, AND MILWAUKEE DO USERS
CAN DIAL-IN TO ESO OR DSC

ROLLA MO USERS DIAL-IN TO DSC

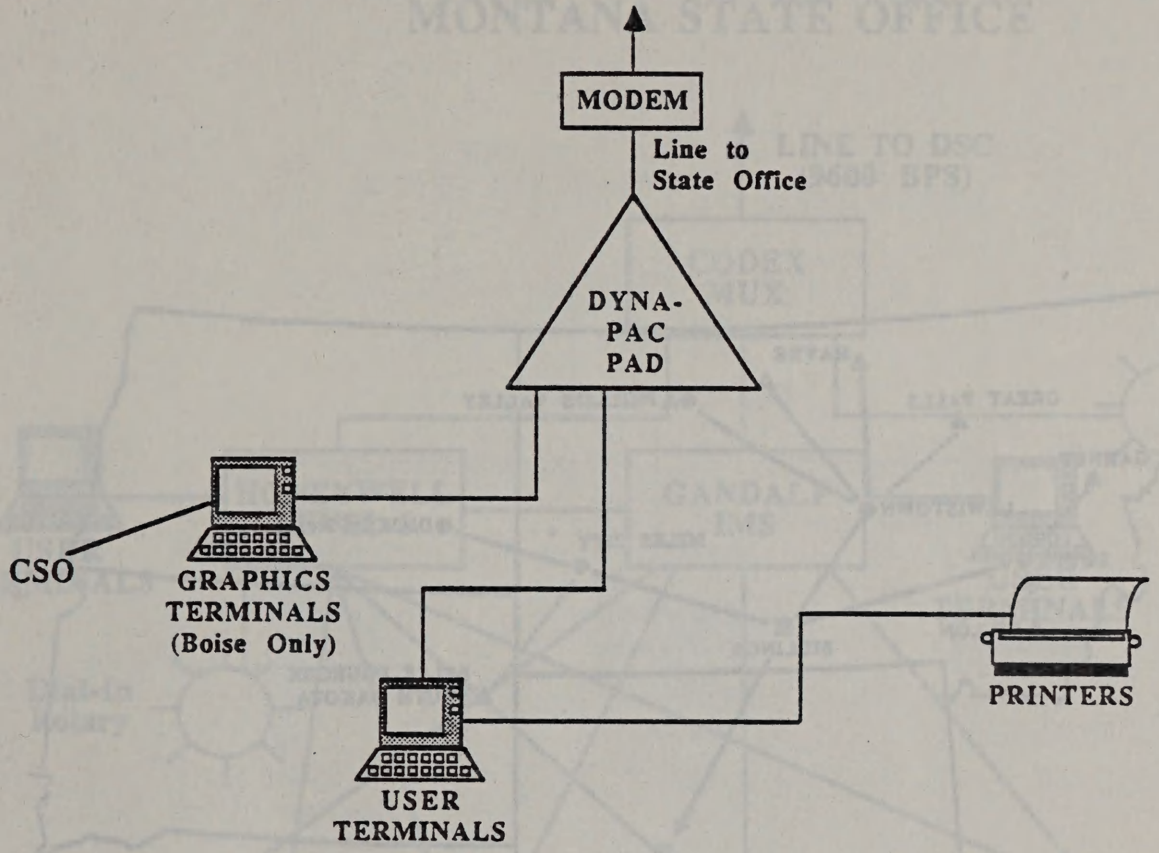
IDAHO STATE OFFICE NETWORK



IDAHO STATE OFFICE



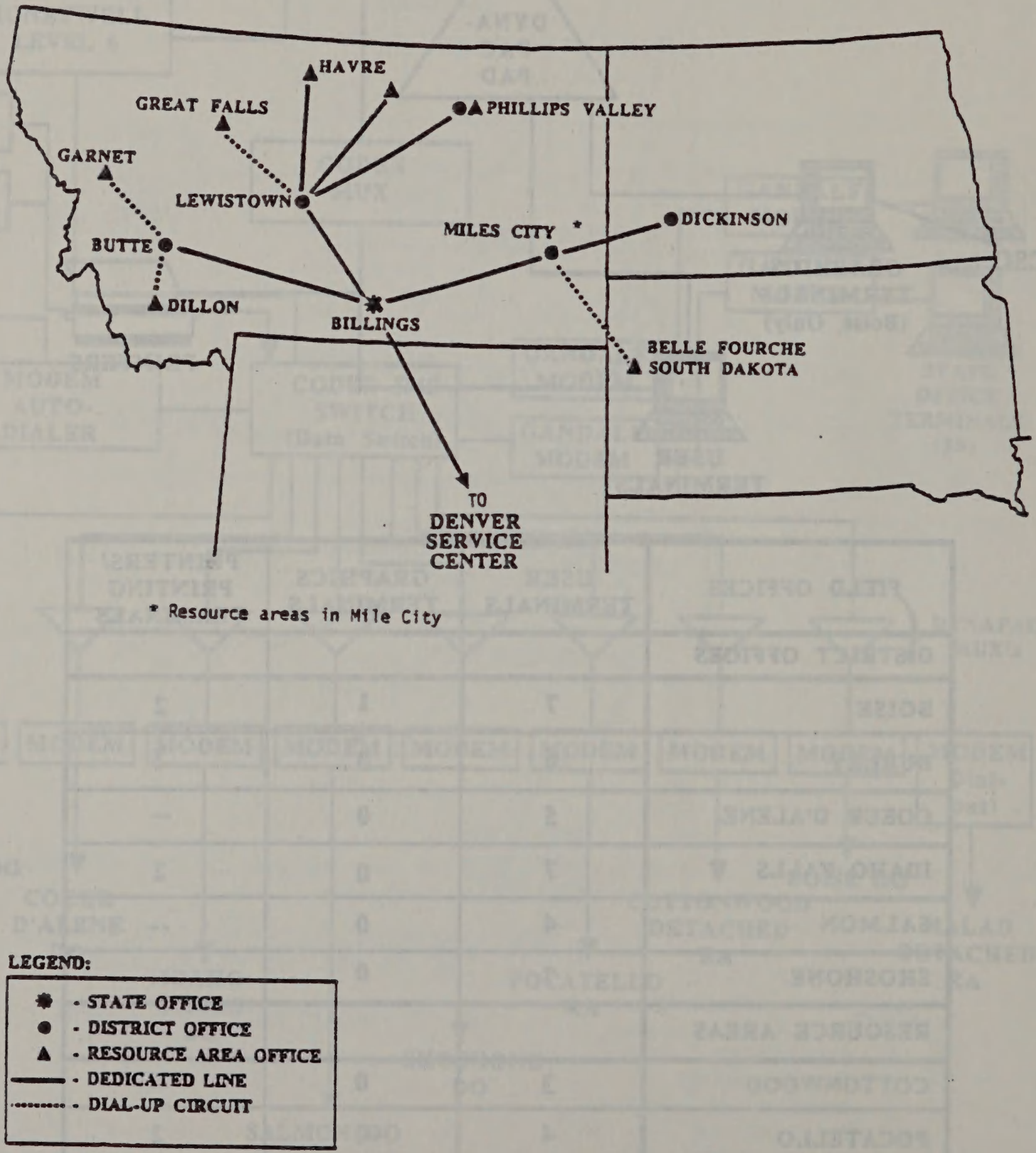
IDAHO DISTRICT AND RESOURCE AREA OFFICES



FIELD OFFICES	USER TERMINALS	GRAPHICS TERMINALS	PRINTERS/ PRINTING TERMINALS
DISTRICT OFFICES			
BOISE	7	1	2
BURLEY	6	0	3
COEUR D'ALENE	5	0	--
IDAHO FALLS	7	0	2
SALMON	4	0	--
SHOSHONE	7	0	--
RESOURCE AREAS			
COTTONWOOD	3	0	--
POCATELLO	4	0	2

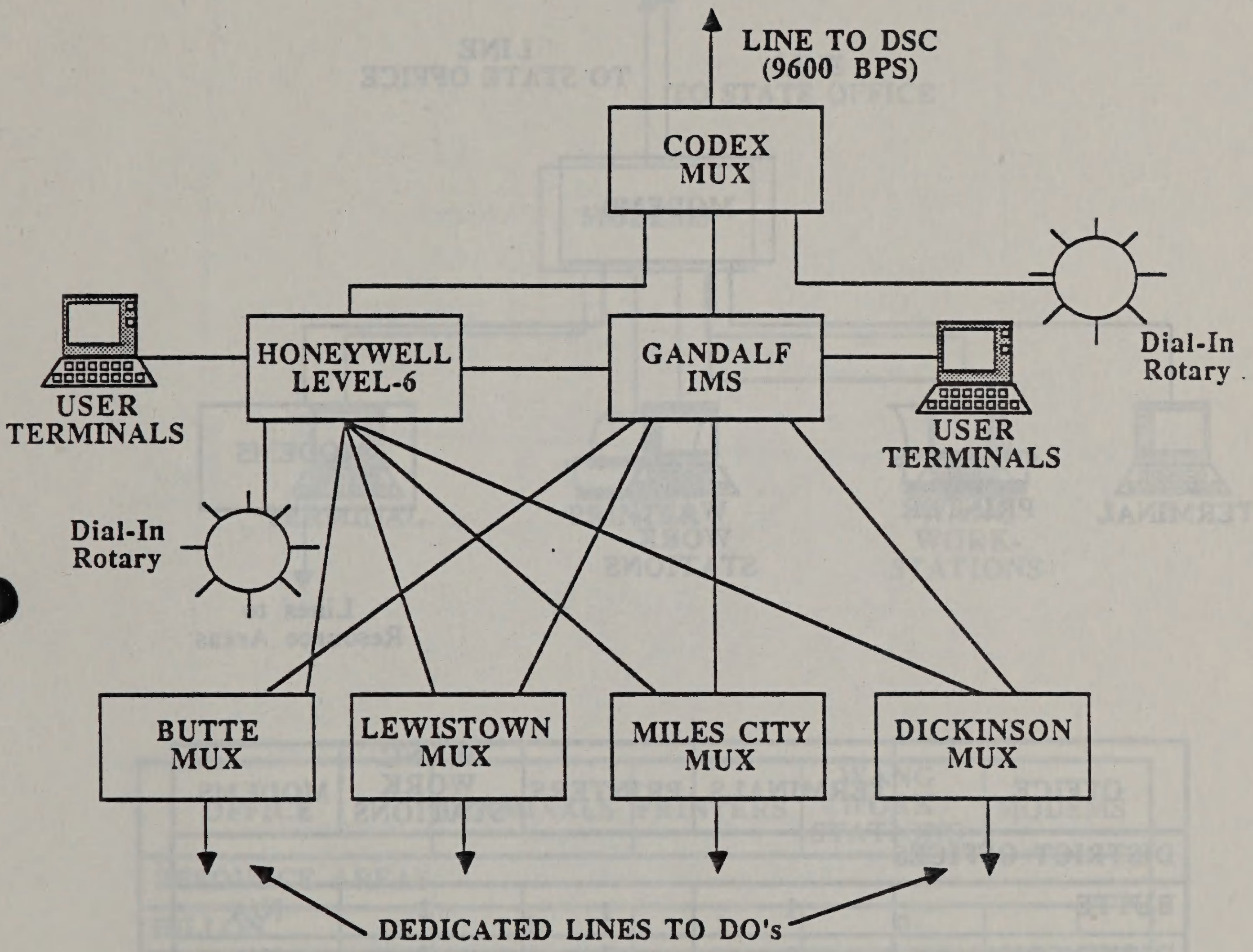
* - PROBABLE NUMBER OF DEVICES; DISTRIBUTION UNAVAILABLE

MONTANA STATE OFFICE NETWORK

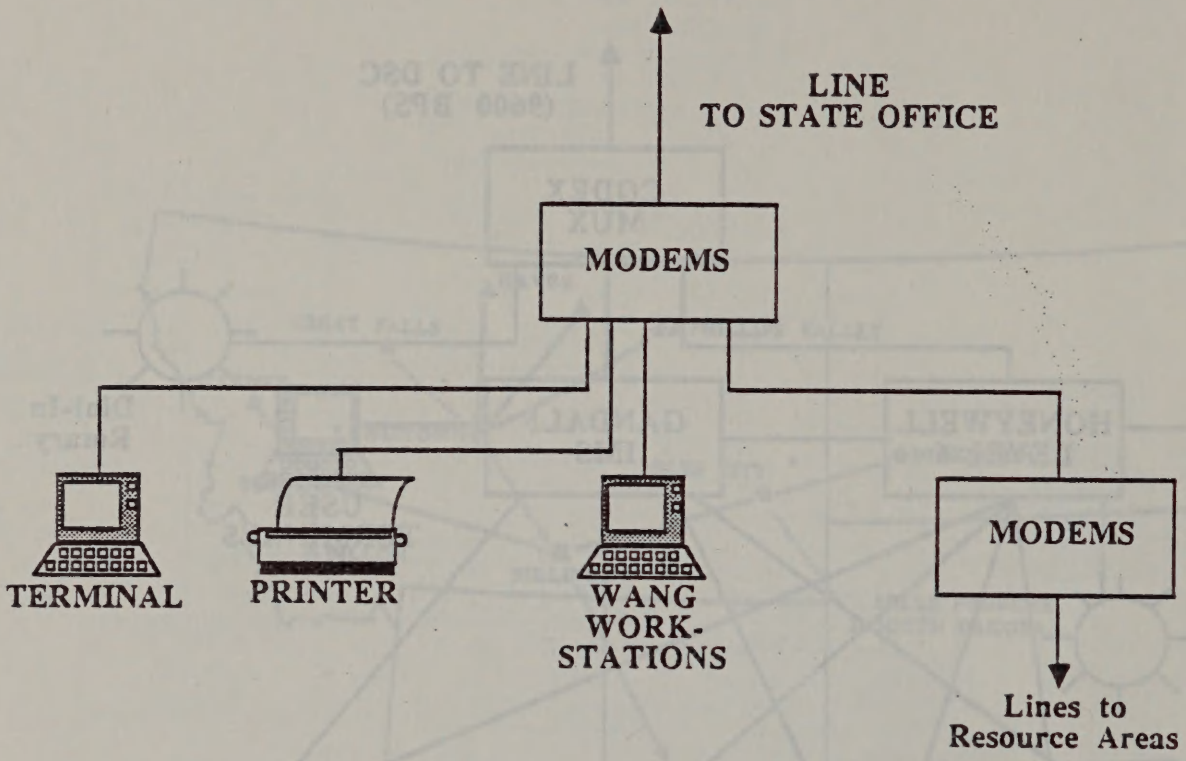


* Resource areas in Mile City

MONTANA STATE OFFICE

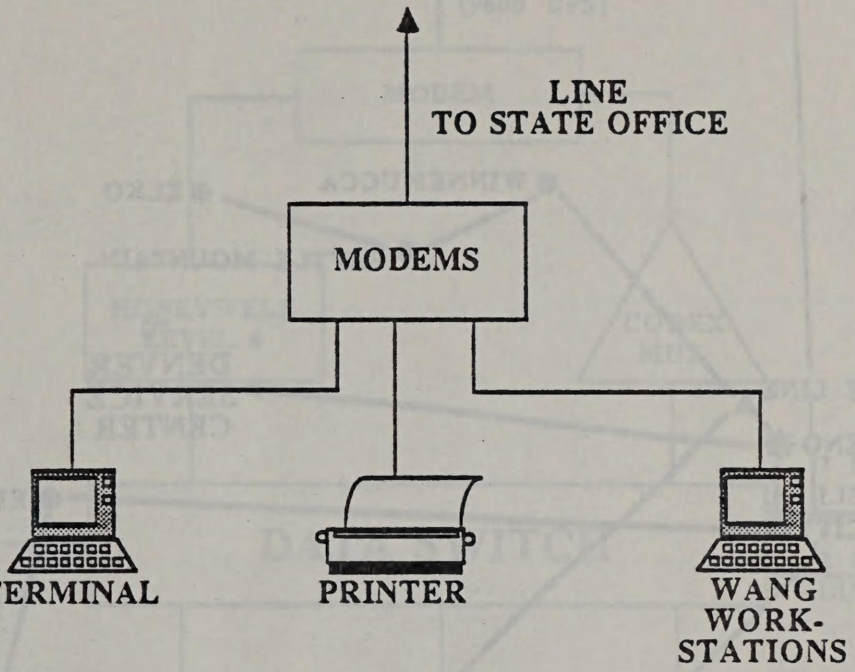


MONTANA DISTRICT OFFICES



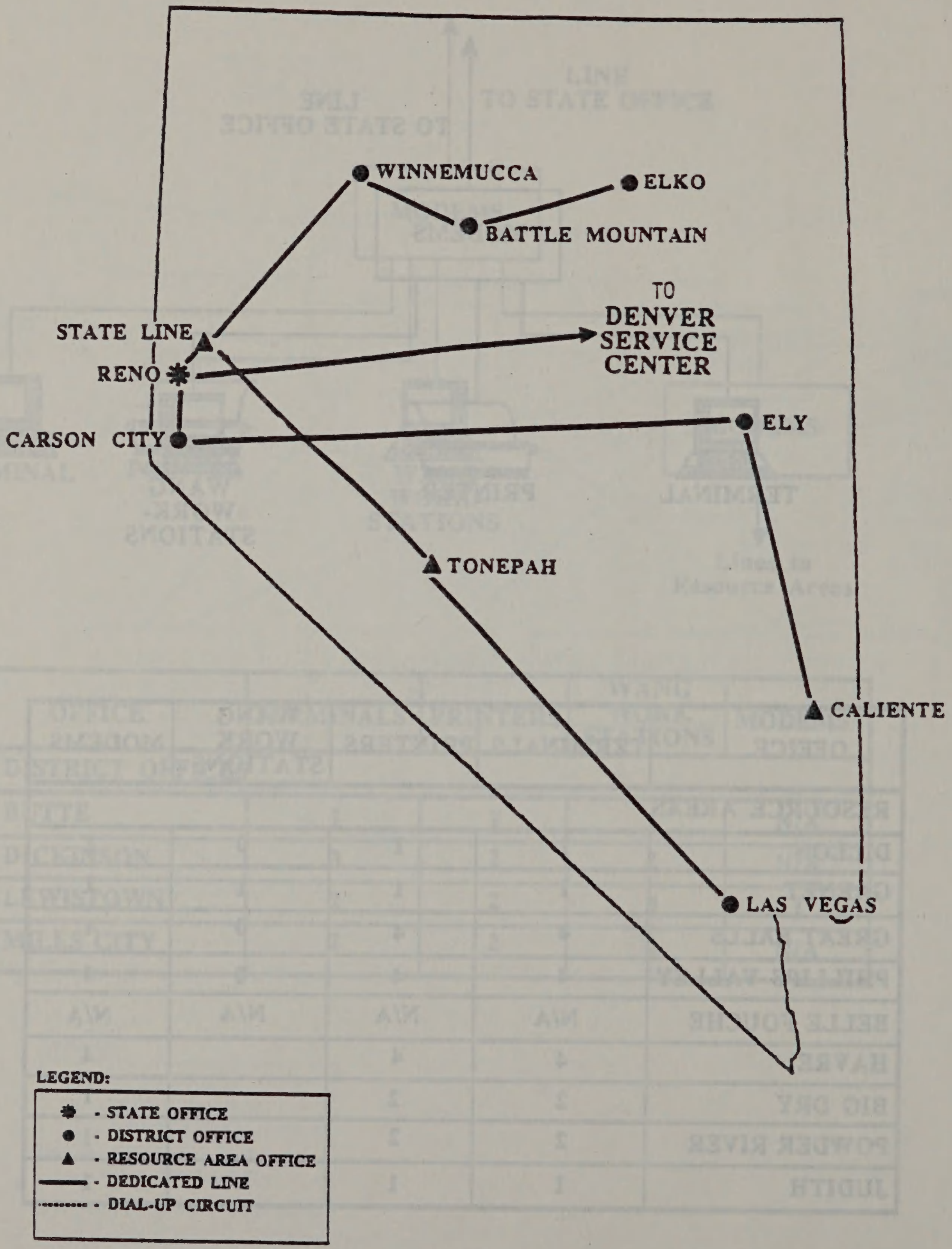
OFFICE	TERMINALS	PRINTERS	WANG WORK STATIONS	MODEMS
DISTRICT OFFICES				
BUTTE	1	1	2	N/A
DICKINSON	3	2	2	N/A
LEWISTOWN	2	2	3	1
MILES CITY	2	2	2	N/A

MONTANA RESOURCE AREAS

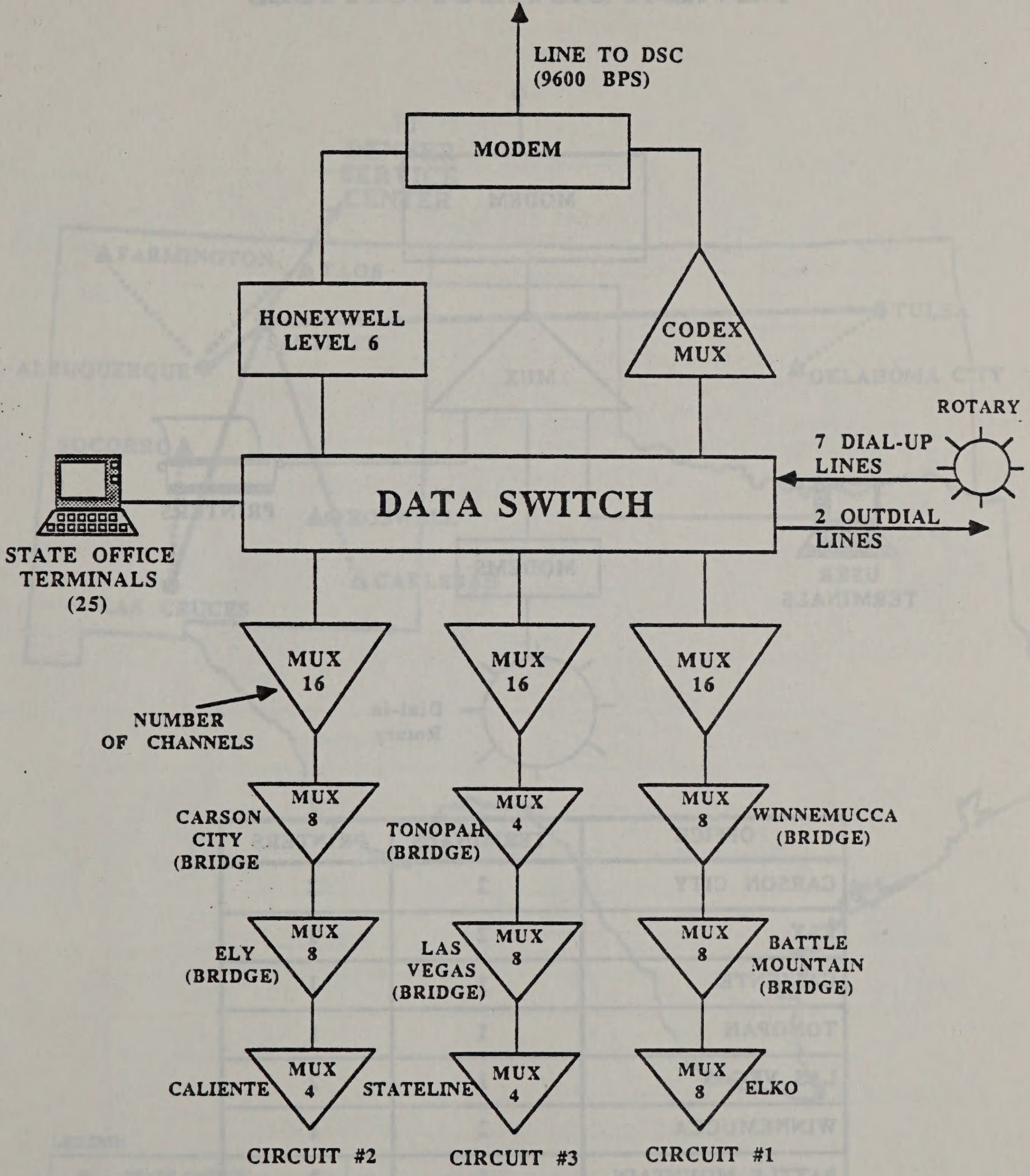


OFFICE	TERMINALS	PRINTERS	WANG WORK STATIONS	MODEMS
RESOURCE AREAS				
DILLON	1	1	0	1
GARNET	1	1	1	1
GREAT FALLS	4	4	0	4
PHILLIPS VALLEY	4	4	0	4
BELLE FOUCHE	N/A	N/A	N/A	N/A
HAVRE	4	4		4
BIG DRY	2	2		1
POWDER RIVER	2	2		1
JUDITH	1	1		1

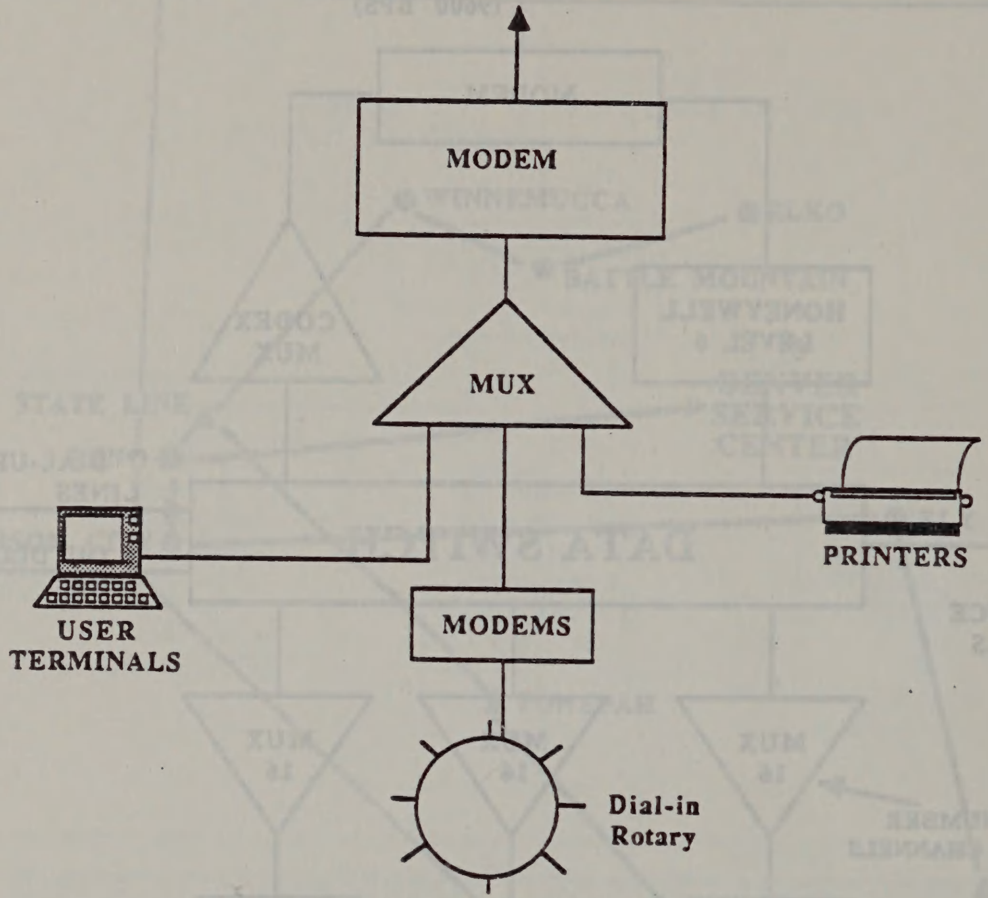
NEVADA STATE OFFICE NETWORK



NEVADA STATE OFFICE

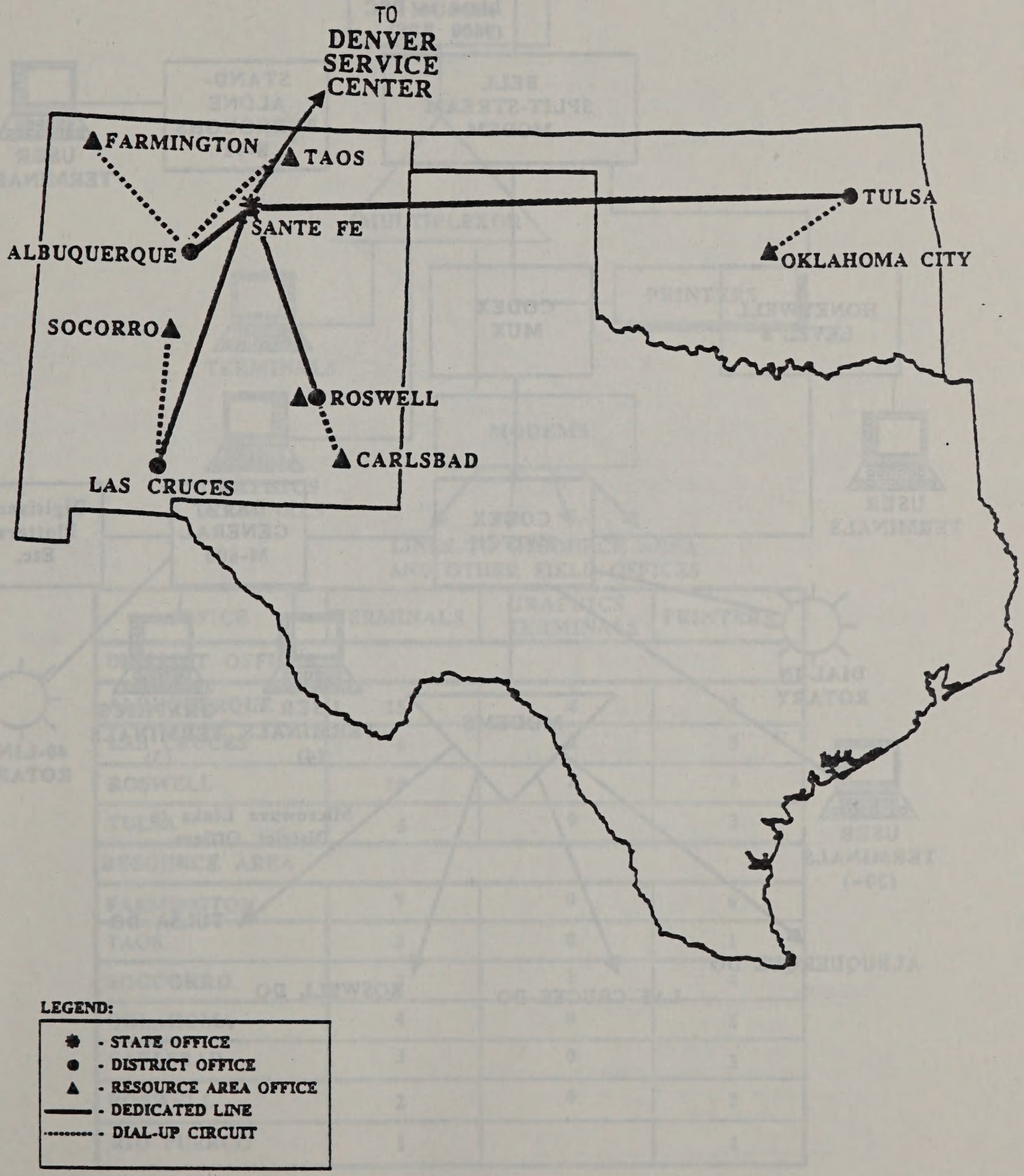


NEVADA DISTRICT OFFICES

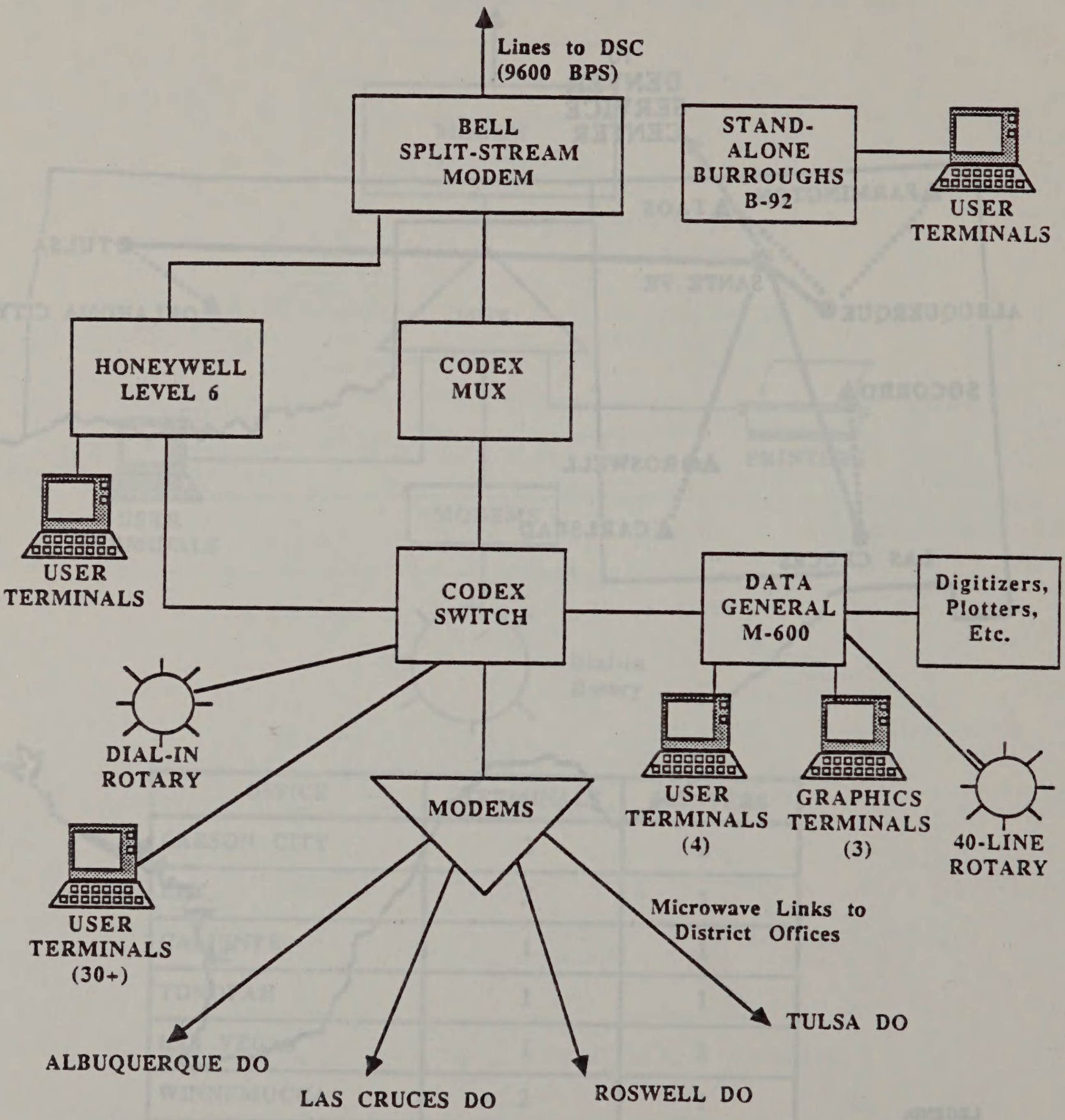


OFFICE	TERMINALS	PRINTERS
CARSON CITY	2	2
ELY	2	1
CALIENTE	1	1
TONOPAH	1	1
LAS VEGAS	1	2
WINNEMUCCA	2	1
BATTLE MOUNTAIN	1	2
ELKO	1	1
STATE LINE RA	1	1

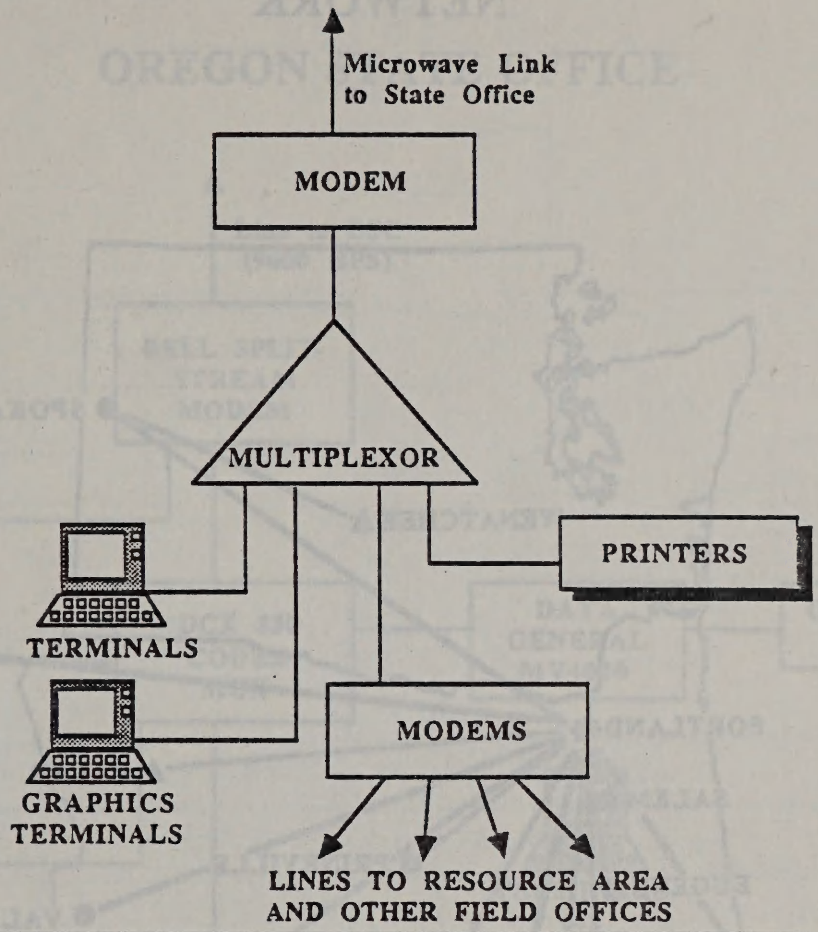
NEW MEXICO STATE OFFICE NETWORK



NEW MEXICO STATE OFFICE

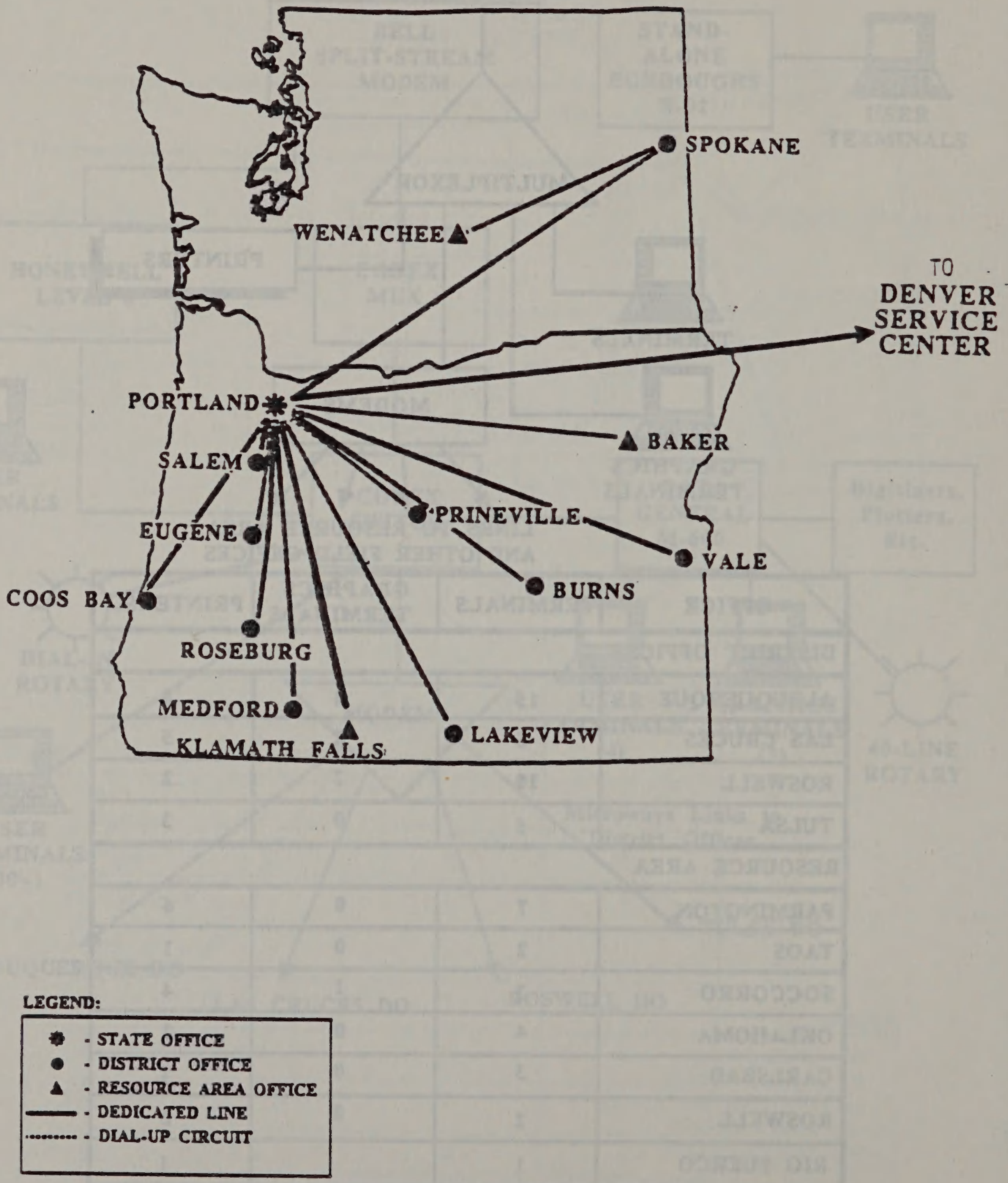


NEW MEXICO DISTRICT OFFICES

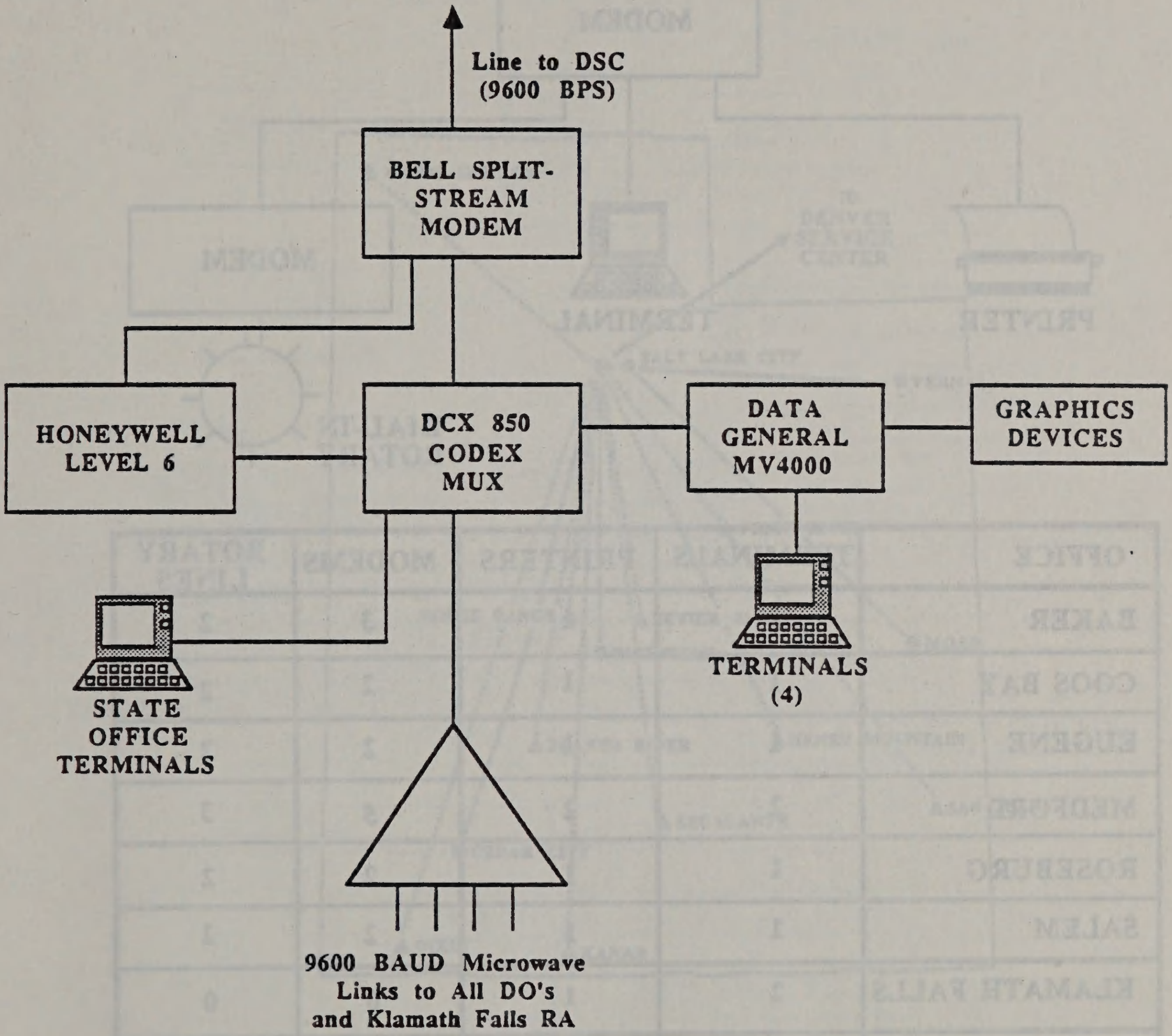

Microwave Link to State Office
MODEM
MULTIPLEXOR
PRINTERS
TERMINALS
GRAPHICS TERMINALS
MODEMS
LINES TO RESOURCE AREA AND OTHER FIELD OFFICES

OFFICE	TERMINALS	GRAPHICS TERMINALS	PRINTERS
DISTRICT OFFICES			
ALBUQUERQUE	15	4	8
LAS CRUCES	6	2	5
ROSWELL	10	2	2
TULSA	5	0	3
RESOURCE AREA			
FARMINGTON	7	0	6
TAOS	2	0	1
SOCCORRO	3	1	4
OKLAHOMA	4	0	2
CARLSBAD	3	0	3
ROSWELL	2	0	2
RIO PUERCO	1		1

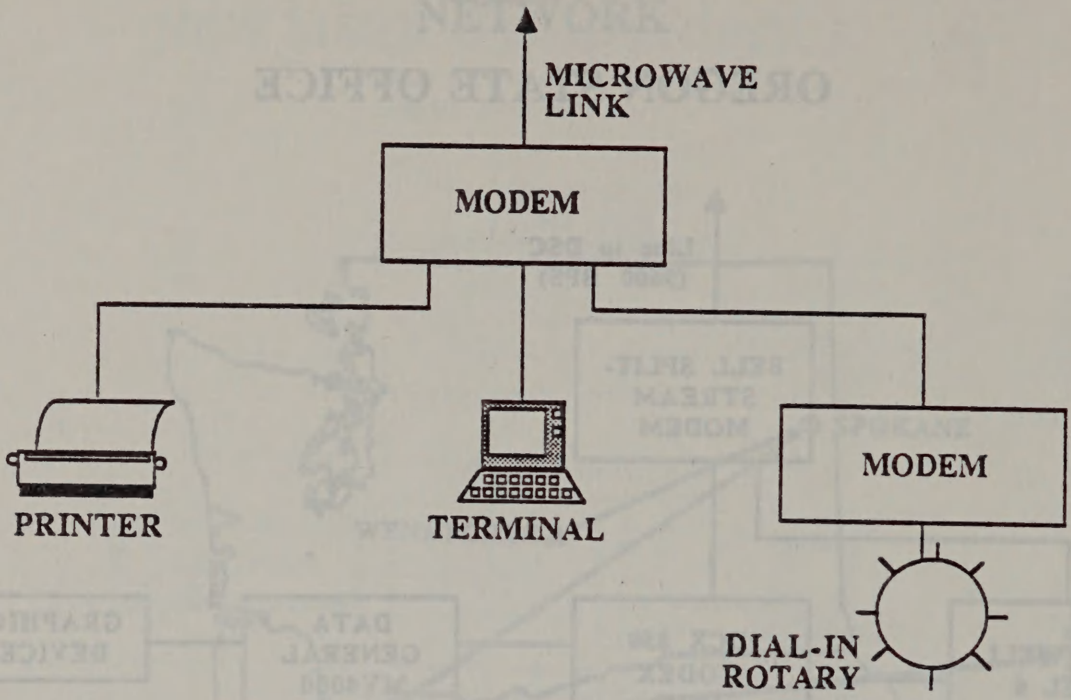
OREGON STATE OFFICE NETWORK



OREGON STATE OFFICE

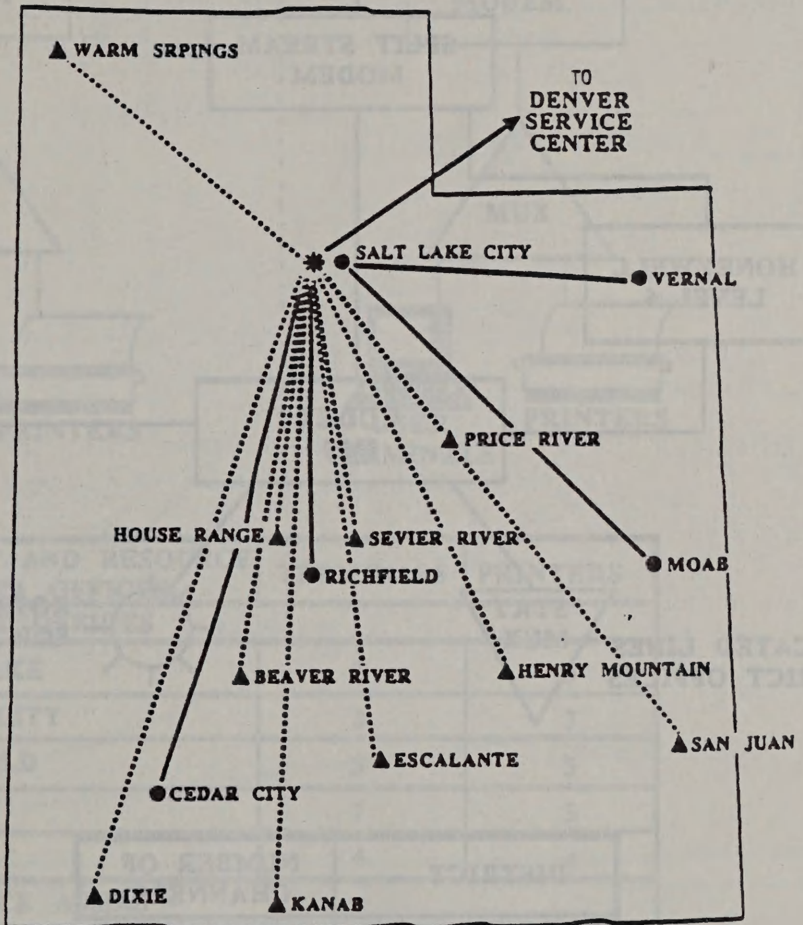


OREGON FIELD OFFICES



OFFICE	TERMINALS	PRINTERS	MODEMS	ROTARY LINES
BAKER	2	1	3	2
COOS BAY	1	1	2	2
EUGENE	1	1	2	2
MEDFORD	2	2	5	3
ROSEBURG	1	1	2	2
SALEM	1	1	2	2
KLAMATH FALLS	2	1	0	0
BURNS	2	1	3	2
LAKEVIEW	2	1	3	2
PRINEVILLE	3	1	3	2
SPOKANE	2	1	3	2
VALE	2	1	3	2

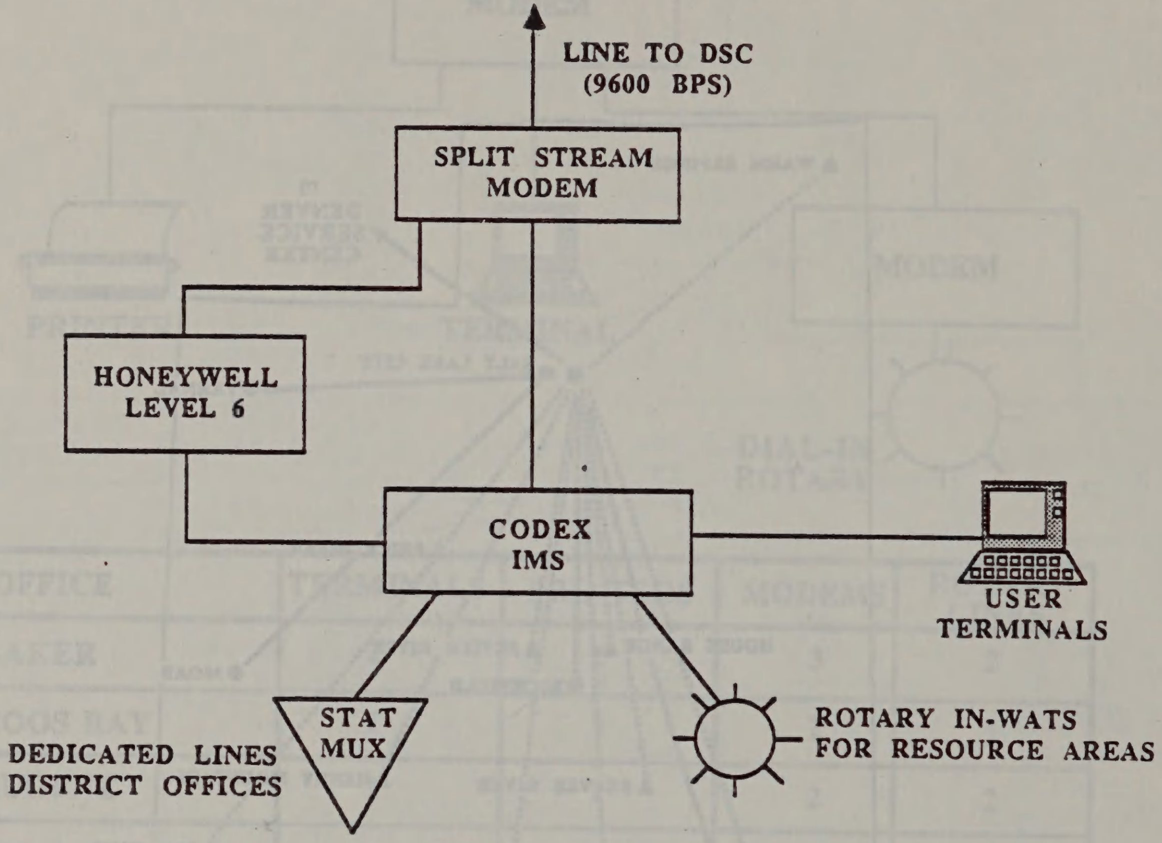
UTAH STATE OFFICE NETWORK



LEGEND:

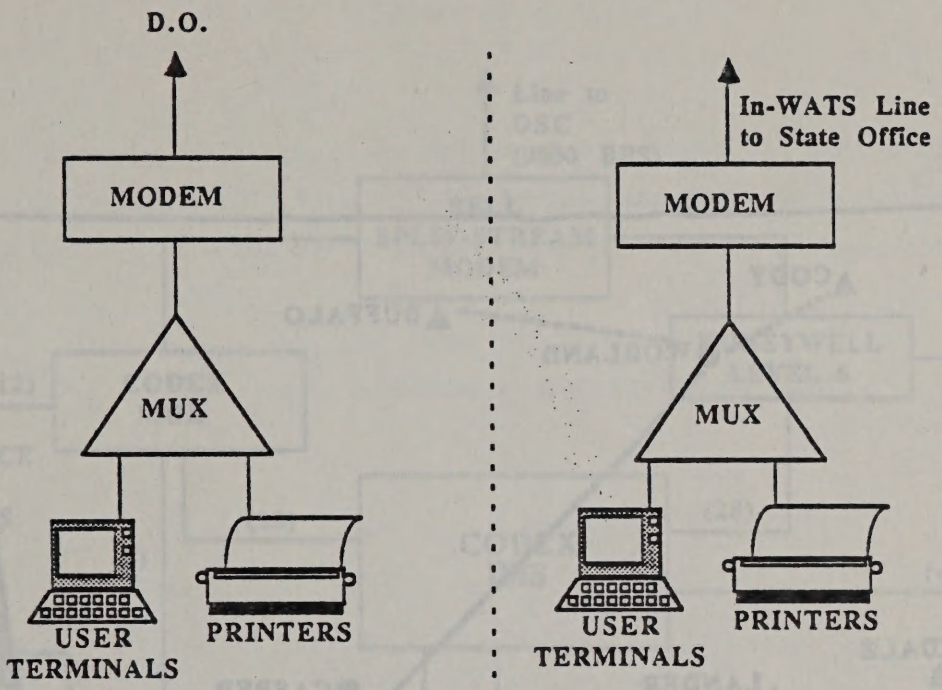
- ✱ - STATE OFFICE
- ● - DISTRICT OFFICE
- ▲ - RESOURCE AREA OFFICE
- ——— - DEDICATED LINE
- ········ - DIAL-UP CIRCUIT

UTAH STATE OFFICE



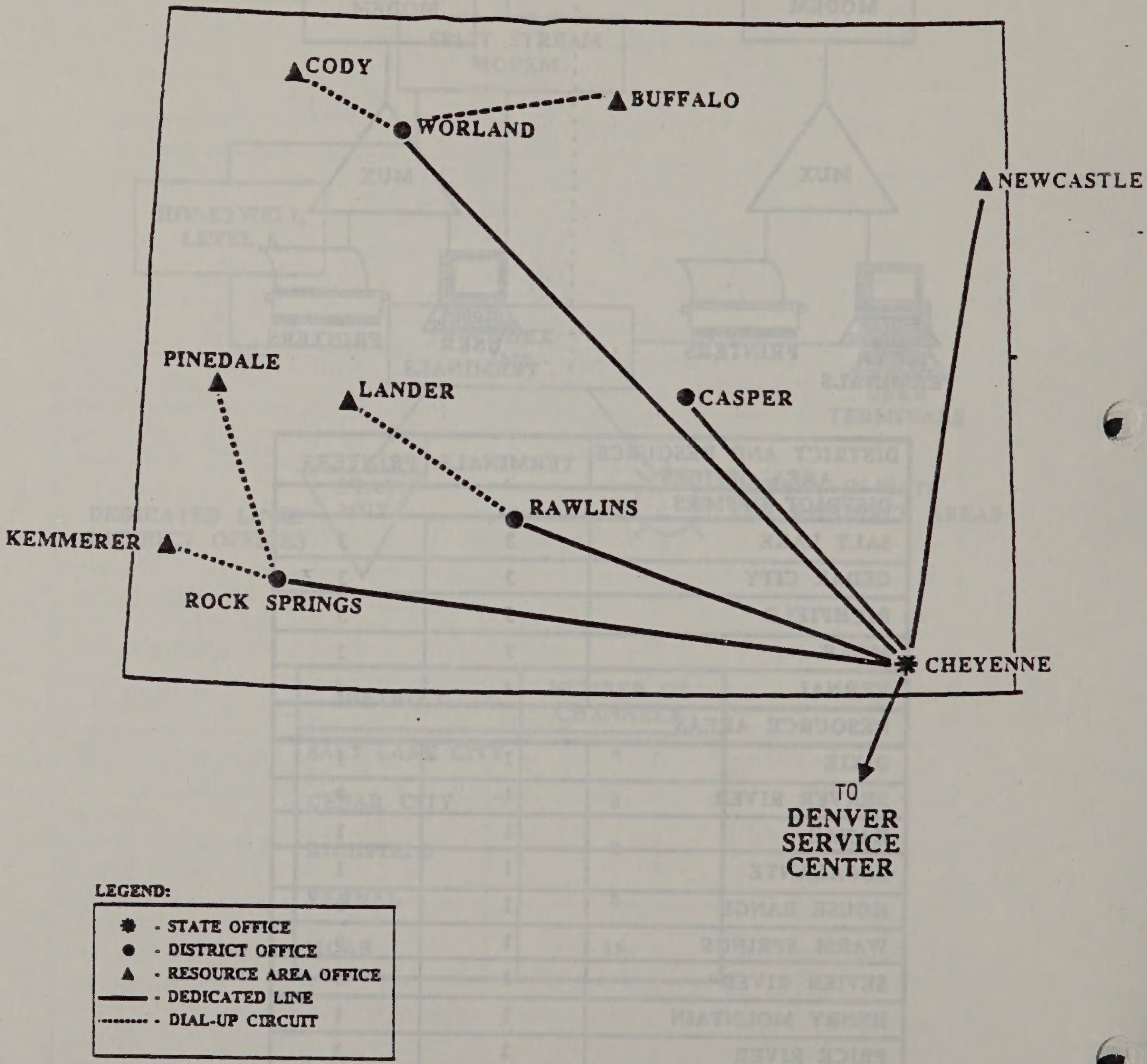
DISTRICT	NUMBER OF CHANNELS
SALT LAKE CITY	4
CEDAR CITY	8
RICHFIELD	8
VERNAL	8
MOAB	16

UTAH DISTRICT OFFICES

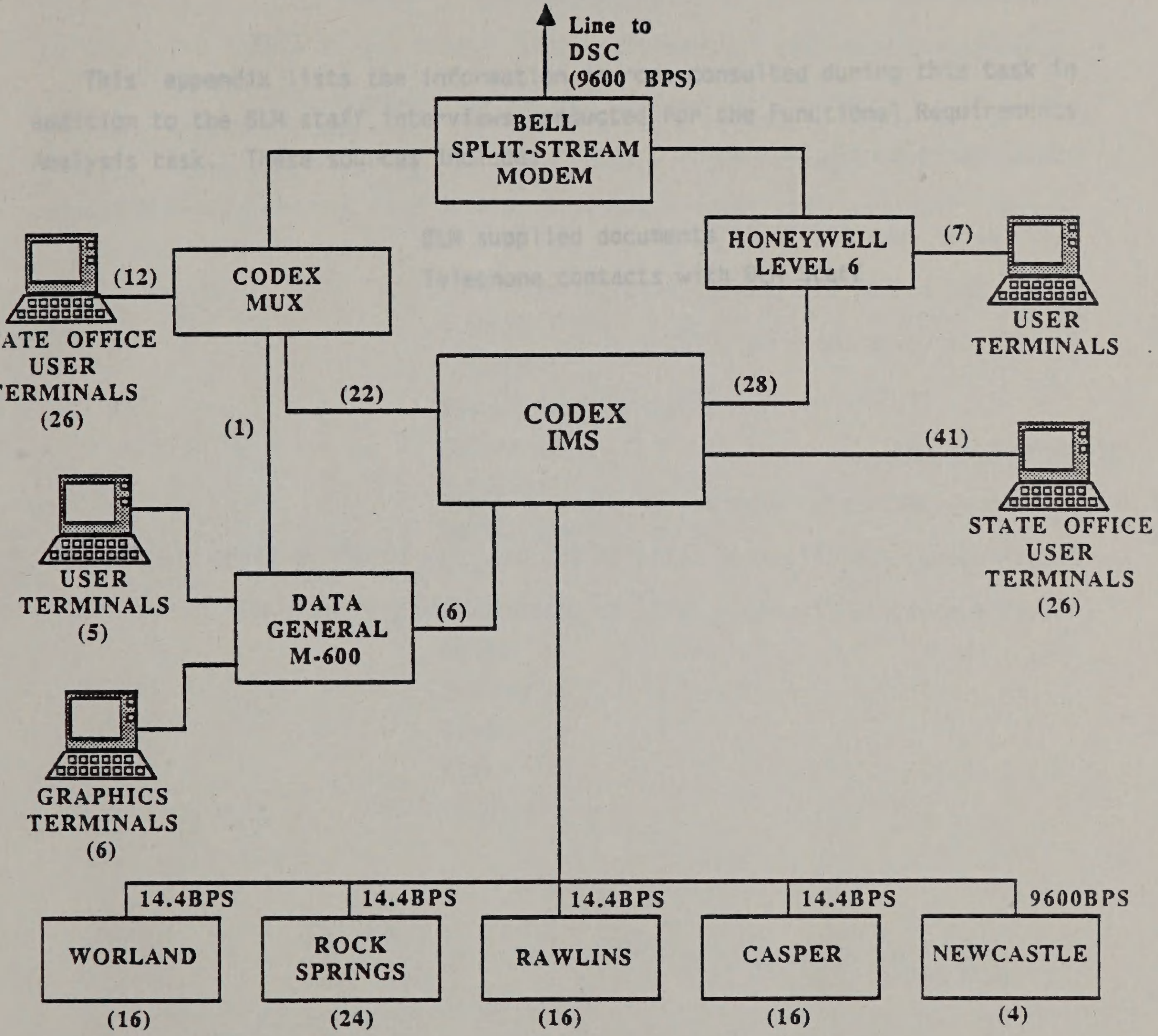


DISTRICT AND RESOURCE AREA OFFICES	TERMINALS	PRINTERS
DISTRICT OFFICES		
SALT LAKE	3	3
CEDAR CITY	3	3
RICHFIELD	5	3
MOAB	7	3
VERNAL	4	4
RESOURCE AREAS		
DIXIE	1	1
BEAVER RIVER	1	0
KANAB	1	1
ESCALANTE	1	1
HOUSE RANGE	1	0
WARM SPRINGS	1	0
SEVIER RIVER	1	0
HENRY MOUNTAIN	1	1
PRICE RIVER	2	2
SAN JUAN	1	0

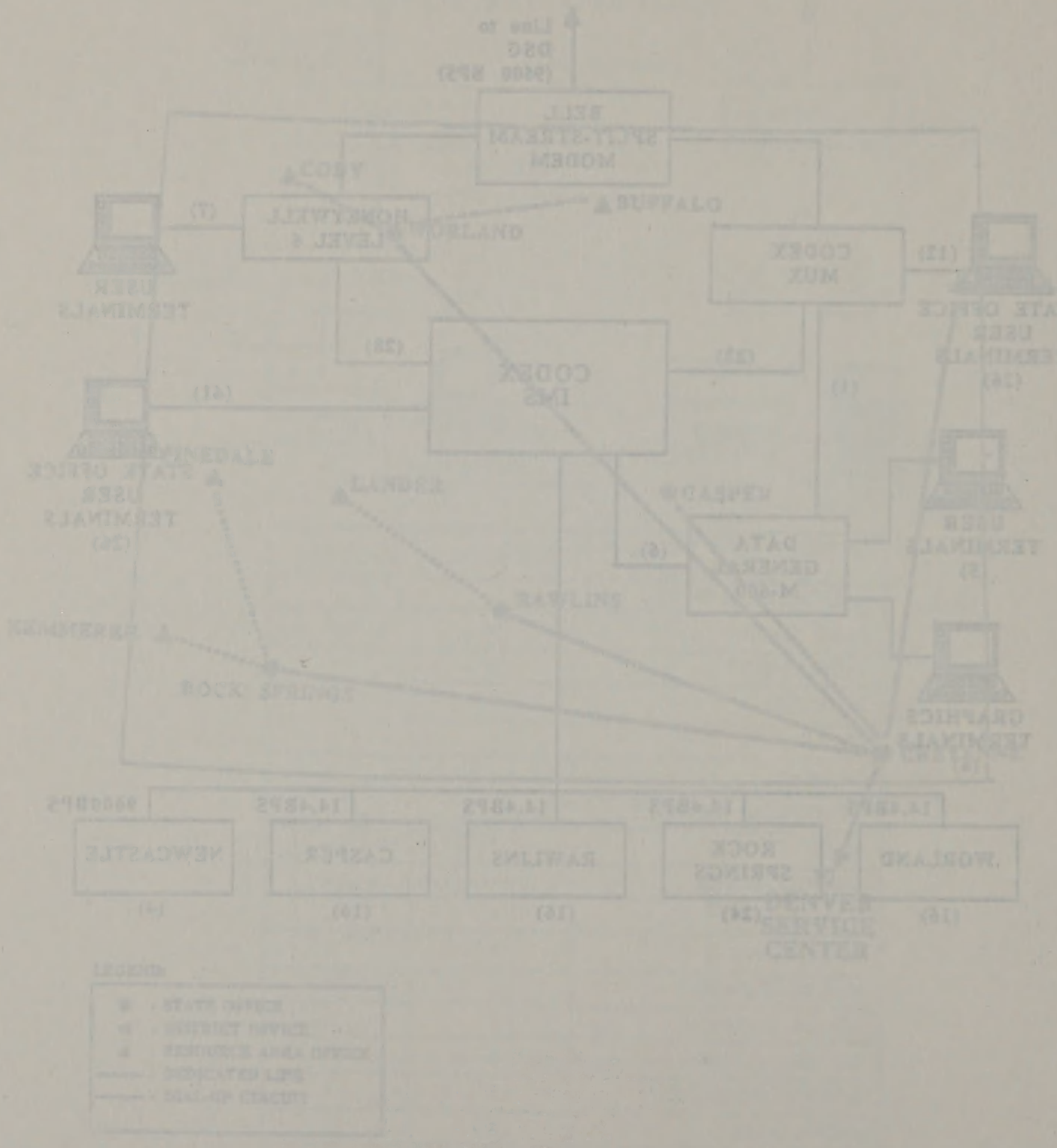
WYOMING STATE OFFICE NETWORK



WYOMING STATE OFFICE



WYOMING STATE OFFICE NETWORK



APPENDIX D

INFORMATION SOURCES

This appendix lists the information sources consulted during this task in addition to the BLM staff interviews conducted for the Functional Requirements Analysis task. These sources include:

BLM supplied documents
Telephone contacts with BLM Staff

BLM Supplied Documents:

Oakridge National Laboratory Call for Data, responses by State Offices, including configurations and equipment, software, and telecommunciations inventories.

Telecommunications Study conducted by DSC staff in 1984

Charge-Back System Data for February, 1982 through August 1985

SARA-H data for March, May, August, October and November 1985

SARA-H Users Manual, Burroughs Computer Services

Central Processor Utilization Study; From ASCD Data Systems, to Director (870) dated June 20, 1985

B-4000 and B-2700 Utilization Statistics

Outside Services Costs for FY85

Telephone Contacts:

Telephone questionnaire/survey of State Offices

Detail request/verification calls to DSC Division Chiefs and Branch Chiefs

Detail request/verification calls to State Office systems staff

APPENDIX E

STATE OFFICE TELEPHONE SURVEY RESULTS

This appendix contains the results of a telephone survey of BLM State offices conducted during December 1985. The surveys are listed in alphabetical order.

Alaska
Arizona
Boise Interagency Fire Center (BIFC)
California
Colorado
Easter States
Idaho
Montana
Nevada
New Mexico
Oregon
Utah
Wyoming

HARDWARE UTILIZATION INVENTORY

CPU TYPE: Honeywell Level 6
LOCATION: Alaska

CPE INSTALLED: Yes OEM
CPE DATA AVAILABLE: Not at this time
TIME PERIOD SAMPLED: Unknown

ESTIMATES OBTAINED:

	0:00 TO 08:00	08:00 TO 16:00	16:00 TO 24:00
CPU UTILIZATION	30 %	80 %	30 %
COMMUNICATIONS UTILIZATION	No Estimate		
I/O ACTIVITY (DISK)	No Estimate		

MAJOR APPLICATION USAGE PERCENTAGES:

Administration	No Estimate
Development	No Estimate
Bureau Wide Fire	No Estimate

CONCURRENT TERMINAL USERS:

AVERAGE	25
MAXIMUM	No Estimate

DIRECT ACCESS SPACE UTILIZED: 100 %

HARDWARE UTILIZATION INVENTORY

CPU TYPE: Honeywell Level 6
LOCATION: Arizona

CPE INSTALLED: Yes
CPE DATA AVAILABLE: Not at this time
TIME PERIOD SAMPLED: N/A

ESTIMATES OBTAINED:

* Arizona has two Level 6s. One Level 6 is dedicated to ORCA. The other is used in other major statewide applications.

	0:00 TO 08:00	08:00 TO 16:00	16:00 TO 24:00
CPU UTILIZATION (ORCA)	0 %	50 % +	0 %
CPU UTILIZATION (User)	0	50 %	0
COMMUNICATIONS UTILIZATION	0	Unknown	0
I/O ACTIVITY (DISK)	N/A	Unknown	N/A

MAJOR APPLICATION USAGE PERCENTAGES:

ORCA Machine	
ORCA	100 %
User Level 6	
INFO-8 (financial)	100 %

CONCURRENT TERMINAL USERS:

Remote Concentration to DPS-8/70	
ORCA Level 6	None
User Level 6	2-3 Average, 5 Maximum
Local to Level 6	
ORCA Level 6	Unknown
User Level 6	12-16 Average, 20 Maximum

HARDWARE UTILIZATION INVENTORY

CPU TYPE:	Honeywell Level 6
LOCATION:	Arizona (Continued)

DIRECT ACCESS SPACE UTILIZED:

ORCA Level 6	50 %
User Level 6	70 %

HARDWARE UTILIZATION INVENTORY

CPU TYPE: Honeywell Level 6
LOCATION: BIFC

CPE INSTALLED: Yes
CPE DATA AVAILABLE: Not at this time
TIME PERIOD SAMPLED: N/A

CPE DATA OBTAINED:

	0:00 TO 08:00	08:00 TO 16:00	16:00 TO 24:00
CPU UTILIZATION	0 %	80-85 %	Unknown
COMMUNICATIONS UTILIZATION	Unknown		
I/O ACTIVITY (DISK)	Unknown		

MAJOR APPLICATION USAGE PERCENTAGES:

Warehouse Inventory	80%
Development	10%
Fire Reporting	10%

CONCURRENT TERMINAL USERS:

AVERAGE	5
MAXIMUM	17

DIRECT ACCESS SPACE UTILIZED: 37%

HARDWARE UTILIZATION INVENTORY

CPU TYPE: Honeywell Level 6
LOCATION: California

CPE INSTALLED: Yes
CPE DATA AVAILABLE: Not at this time
TIME PERIOD SAMPLED: N/A

ESTIMATES OBTAINED:

	0:00 TO 08:00	08:00 TO 16:00	16:00 TO 24:00
CPU UTILIZATION	0 %	50-60 %	10 %
COMMUNICATIONS UTILIZATION	N/A	Unknown	Unknown
I/O ACTIVITY (DISK)	N/A	Unknown	Unknown

MAJOR APPLICATION USAGE PERCENTAGES:

ORCA	50 %
Survey Data Capture	40 %

CONCURRENT TERMINAL USERS:

REMOTE CONCENTRATION	
AVERAGE	5
MAXIMUM	8
LOCAL L/6	
AVERAGE	15-18
MAXIMUM	20

DIRECT ACCESS SPACE UTILIZED: 70 %

HARDWARE UTILIZATION INVENTORY

CPU TYPE:	Honeywell Level 6
LOCATION:	Colorado
CPE INSTALLED:	Yes
CPE DATA AVAILABLE:	Not at this time
TIME PERIOD SAMPLED:	N/A

ESTIMATES DATA OBTAINED:

	0:00 TO 08:00	08:00 TO 16:00	16:00 TO 24:00
CPU UTILIZATION	0 %	75 %	0 %
COMMUNICATIONS UTILIZATION	N/A	Unknown	N/A
I/O ACTIVITY (DISK)	N/A	Unknown	N/A

MAJOR APPLICATION USAGE PERCENTAGES:

ORCA	30 %
ALMRS	30 %
DEF	25 %

CONCURRENT TERMINAL USERS:

AVERAGE	15
MAXIMUM	25

DIRECT ACCESS SPACE UTILIZED: 50 % (was greater prior to installation of 413 M Winchester)

HARDWARE UTILIZATION INVENTORY

CPU TYPE: Honeywell Level 6
LOCATION: Eastern States Office

CPE INSTALLED: Yes
CPE DATA AVAILABLE: Not at this time
TIME PERIOD SAMPLED: N/A

ESTIMATES OBTAINED:

	0:00 TO 08:00	08:00 TO 16:00	16:00 TO 19:00
CPU UTILIZATION	0 %	50 %	35 %
COMMUNICATIONS UTILIZATION	None	Unknown	None
I/O ACTIVITY (DISK)	None	1,150,532	Unknown

MAJOR APPLICATION USAGE PERCENTAGES:

ORCA	(1)	81 %
Budget	(2)	10 %
LLD	(3)	4 %
INFO	(4)	5 %

CONCURRENT TERMINAL USERS:

AVERAGE 8 to 18
MAXIMUM 28

DIRECT ACCESS SPACE UTILIZED: 99 %

HARDWARE UTILIZATION INVENTORY

CPU TYPE: Honeywell Level 6
LOCATION: Idaho

CPE INSTALLED: Yes
CPE DATA AVAILABLE: Not at this time
TIME PERIOD SAMPLED: N/A

ESTIMATES OBTAINED:

	0:00 TO 08:00	08:00 TO 16:00	16:00 TO 24:00
CPU UTILIZATION	0 %	LESS THAN 50 %	0 %
COMMUNICATIONS UTILIZATION	No Estimate		
I/O ACTIVITY (DISK)	No Estimate		

MAJOR APPLICATION USAGE PERCENTAGES:

Delegation of Authority	No Estimate
Appraisal Case Workload	No Estimate
RMAS	No Estimate
ALMRS	No Estimate
Resource Monitor System	No Estimate

CONCURRENT TERMINAL USERS:

AVERAGE	6
MAXIMUM	12 - 18

DIRECT ACCESS SPACE UTILIZED: Less than 50 %

HARDWARE UTILIZATION INVENTORY

CPU TYPE: Honeywell Level 6
LOCATION: Montana

CPE INSTALLED: Yes
CPE DATA AVAILABLE: Yes
TIME PERIOD SAMPLED: Dec. 21, 1985 to Jan. 10, 1986

CPE DATA OBTAINED: Not available at this time

	0:00 TO 08:00	08:00 TO 16:00	16:00 TO 24:00
CPU UTILIZATION	0 %	48 %	0 %
COMMUNICATIONS UTILIZATION	No Estimate		
I/O ACTIVITY (DISK)	No estimate		

MAJOR APPLICATION USAGE PERCENTAGES:

ORCA	50 %
Survey Data	20 %
Mining Claims	10 %

CONCURRENT TERMINAL USERS:

AVERAGE	3
MAXIMUM	7

DIRECT ACCESS SPACE UTILIZED: 47 %

FTF Activity:
Characters per day
Average 5,097,481
Maximum 14,661,411

HARDWARE UTILIZATION INVENTORY

CPU TYPE: Honeywell Level 6
LOCATION: Nevada

CPE INSTALLED: Yes
CPE DATA AVAILABLE: Not at this time
TIME PERIOD SAMPLED: N/A

CPE ESTIMATES OBTAINED:

	0:00 TO 08:00	08:00 TO 16:00	16:00 TO 24:00
CPU UTILIZATION	0 %	65-70 %	0 %
COMMUNICATIONS UTILIZATION	N/A	Unknown	N/A
I/O ACTIVITY (DISK)	N/A	Unknown	N/A

MAJOR APPLICATION USAGE PERCENTAGES:

ALMRS	75 %
PAY/PERS	10 %

CONCURRENT TERMINAL USERS:

REMOTE CONCENTRATION

AVERAGE	4
MAXIMUM	9

LOCAL LEVEL 6 USE

AVERAGE	9
MAXIMUM	20

DIRECT ACCESS SPACE UTILIZED: 60-70 %

HARDWARE UTILIZATION INVENTORY

CPU TYPE:	Honeywell Level 6
LOCATION:	New Mexico
CPE INSTALLED:	Yes (ICS)
CPE DATA AVAILABLE:	Not at this time
TIME PERIOD SAMPLED:	N/A

CPE ESTIMATES OBTAINED:

	0:00 TO 08:00	08:00 TO 16:00	16:00 TO 24:00
CPU UTILIZATION	0 %	80 %	0 %
COMMUNICATIONS UTILIZATION	No Estimate		
I/O ACTIVITY (DISK)	No Estimate		

MAJOR APPLICATION USAGE PERCENTAGES:

ALMRS	50 %
Dam Safety	No Estimate
Cave Classdification	No Estimate
Training Plan	No Estimate
RMAS	25 %

CONCURRENT TERMINAL USERS:

AVERAGE	5
MAXIMUM	5

DIRECT ACCESS SPACE UTILIZED: 70 %

HARDWARE UTILIZATION INVENTORY

CPU TYPE: Honeywell Level 6
LOCATION: Oregon

CPE INSTALLED: Yes
CPE DATA AVAILABLE: Not at this time
TIME PERIOD SAMPLED: N/A

CPE ESTIMATES OBTAINED:

	0:00 TO 08:00	08:00 TO 16:00	16:00 TO 24:00
CPU UTILIZATION	0 %	No Estimate	0 %
COMMUNICATIONS UTILIZATION	N/A	No Estimate	N/A
I/O ACTIVITY (DISK)	N/A	No Estimate	N/A

MAJOR APPLICATION USAGE PERCENTAGES:

ORCA	95 %
Financial Management	5 %

CONCURRENT TERMINAL USERS:

AVERAGE	6
MAXIMUM	20

DIRECT ACCESS SPACE UTILIZED: Unknown... Appears adequate

HARDWARE UTILIZATION INVENTORY

CPU TYPE:	Honeywell Level 6
LOCATION:	Utah
CPE INSTALLED:	Yes
CPE DATA AVAILABLE:	Not at this time
TIME PERIOD SAMPLED:	N/A

CPE ESTIMATES OBTAINED:

	0:00 TO 08:00	08:00 TO 16:00	16:00 TO 24:00
CPU UTILIZATION	0 %	40 %	30 %
COMMUNICATIONS UTILIZATION	N/A	Unknown	N/A
I/O ACTIVITY (DISK)	N/A	Heavy	Medium

MAJOR APPLICATION USAGE PERCENTAGES:

ORCA	50 %
Data Entry	20 %
RMAS	10 %
OP Budget	5 %
Remote Conc.	10 %

CONCURRENT TERMINAL USERS:

AVERAGE	15
MAXIMUM	30

DIRECT ACCESS SPACE UTILIZED: 70 %

HARDWARE UTILIZATION INVENTORY

CPU TYPE: Honeywell Level 6
LOCATION: Wyoming

CPE INSTALLED: Yes
CPE DATA AVAILABLE: Not at this time
TIME PERIOD SAMPLED: N/A

CPE ESTIMATES OBTAINED:

	0:00 TO 08:00	08:00 TO 16:00	16:00 TO 24:00
CPU UTILIZATION	0 %	95 %	0 %
COMMUNICATIONS UTILIZATION	N/A	Unknown	N/A
I/O ACTIVITY (DISK)	NA	Unknown	N/A

MAJOR APPLICATION USAGE PERCENTAGES:

INFO	50 %
ALMRS	25 %
Pay/Pers	Unknown
Budget	Unknown
Withdrawal Review	Unknown

CONCURRENT TERMINAL USERS:

AVERAGE	12
MAXIMUM	12

DIRECT ACCESS SPACE UTILIZED: 70 %

APPENDIX F

DPS-8/70 APPLICATION USAGE BY STATE OFFICE

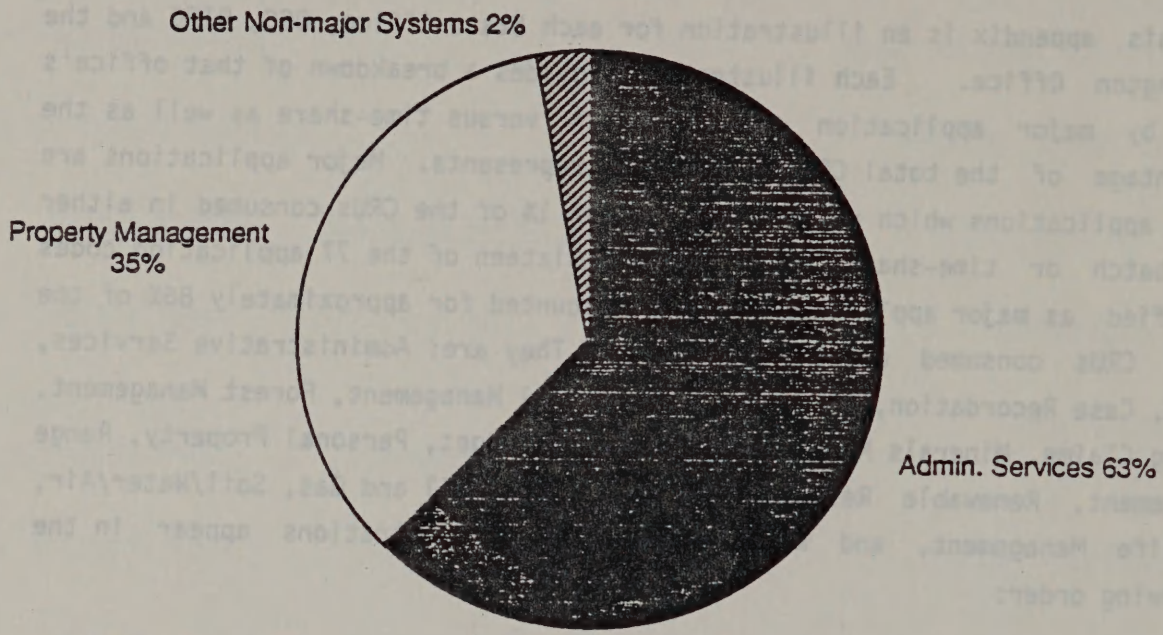
This appendix is an illustration for each State Office, DSC, BIFC and the Washington Office. Each illustration provides a breakdown of that office's CRUs by major application and by batch versus time-share as well as the percentage of the total CRUs that office represents. Major applications are those applications which represent more than 1% of the CRUs consumed in either the batch or time-share environments. Sixteen of the 77 application codes qualified as major applications. They accounted for approximately 86% of the total CRUs consumed on the DPS-8/70. They are: Administrative Services, ALMRS, Case Recordation, Charge-back, Financial Management, Forest Management, Mining Claims, Minerals Management, Operating Budget, Personal Property, Range Management, Renewable Resources, Simultaneous Oil and Gas, Soil/Water/Air, Wildlife Management, and Withdrawals. The illustrations appear in the following order:

Alaska
Arizona
Boise Interagency Fire Center
California
Colorado
Denver Service Center
Eastern States
Idaho
Montana
Nevada
New Mexico
Oregon
Utah
Washington Office
Wyoming

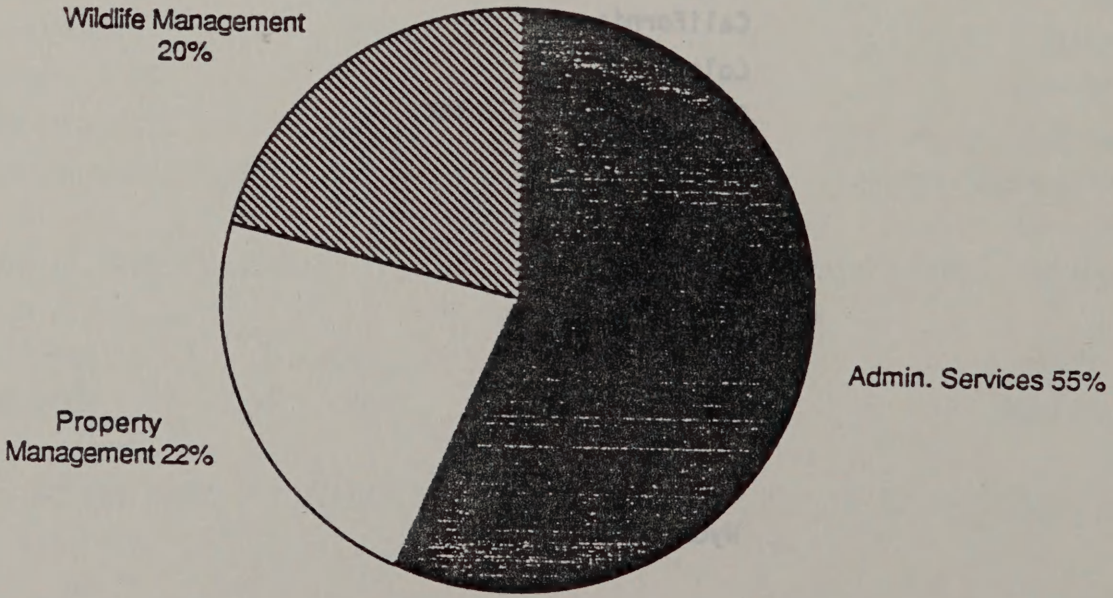
ALASKA STATE OFFICE

Computer Resource Units for DPS-8/70
(October 1985 to February 1986)

BATCH
(18% of Total Alaska CRUs)



TIMESHARE
(82% of Total Alaska CRUs)

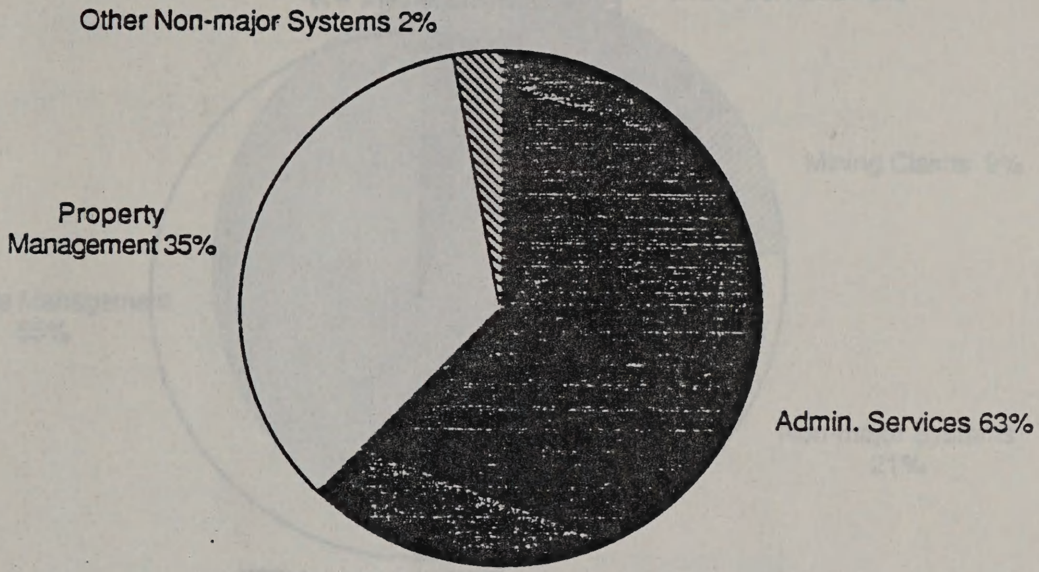


Alaska Represents .2% of All DPS-8/70 CRUs.

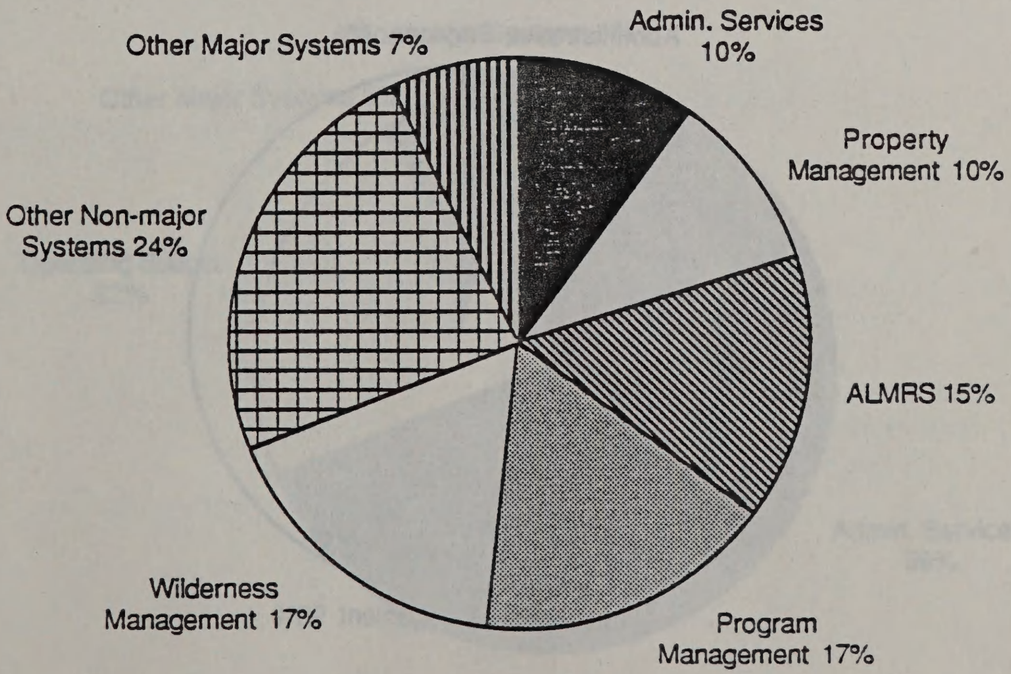
ARIZONA STATE OFFICE

Computer Resource Units for DPS-8/70
(October 1985 to February 1986)

BATCH
(58% of Total Arizona CRUs)



TIME SHARE
(42% of Total Arizona CRUs)

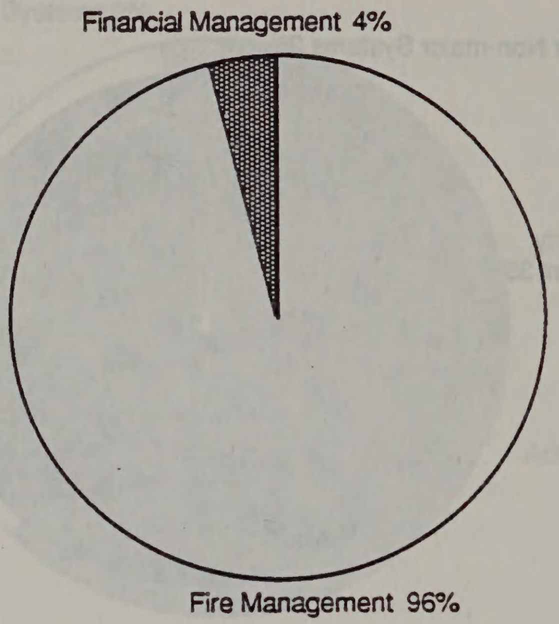


Arizona Represents 1.4% of All DPS-8/70 CRUs.

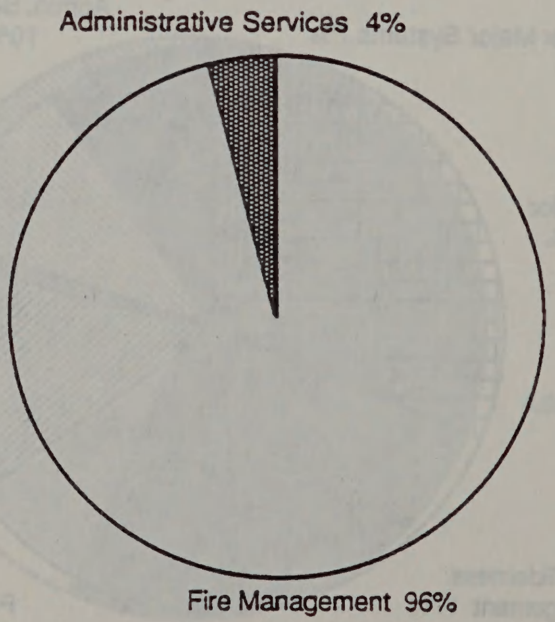
BIFC

Computer Resource Units for DPS-8/70
(October 1985 to February 1986)

BATCH
(11% of Total BIFC CRUs)



TIME SHARE
(89% of Total BIFC CRUs)

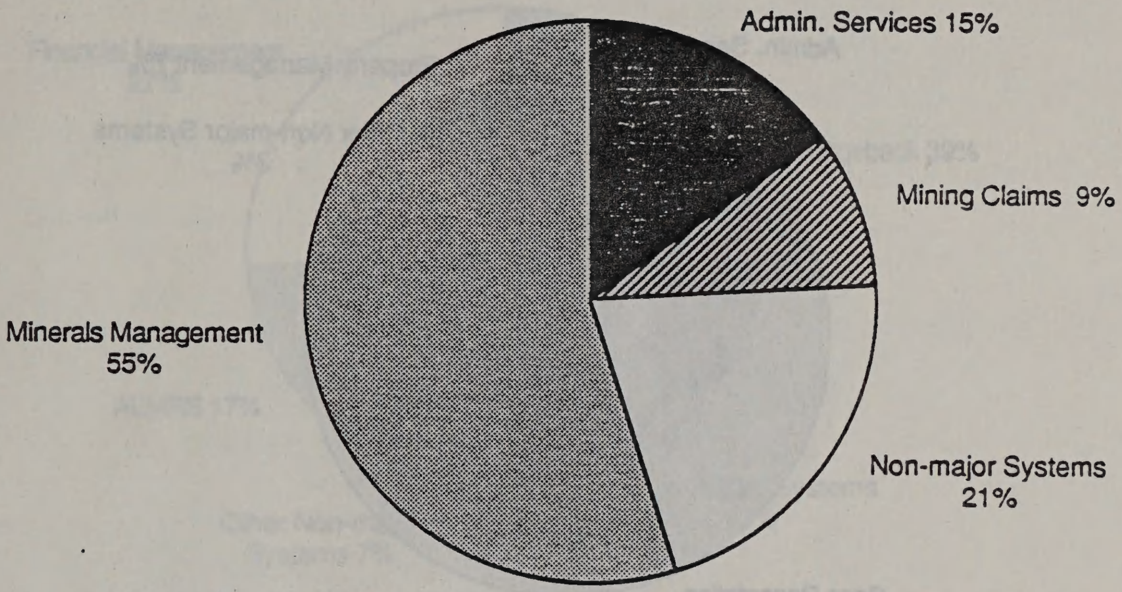


BIFC Represents .3% of All DPS-8/70 CRUs.

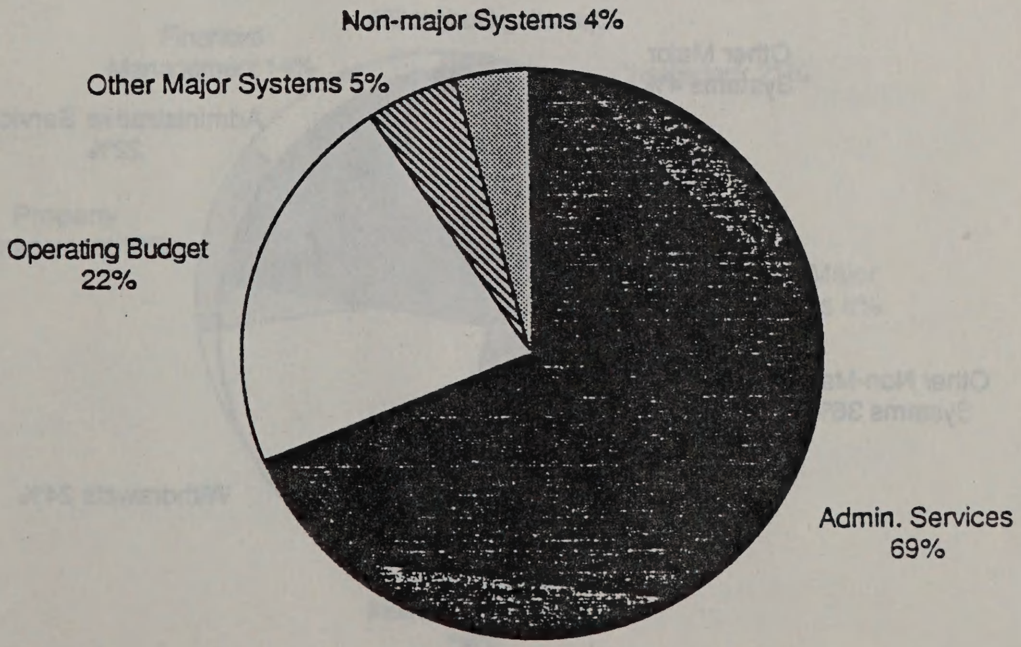
CALIFORNIA STATE OFFICE

Computer Resource Units for DPS-8/70
(October 1985 to February 1986)

BATCH
(25% of Total California CRUs)



TIME SHARE
(75% of Total California CRUs)

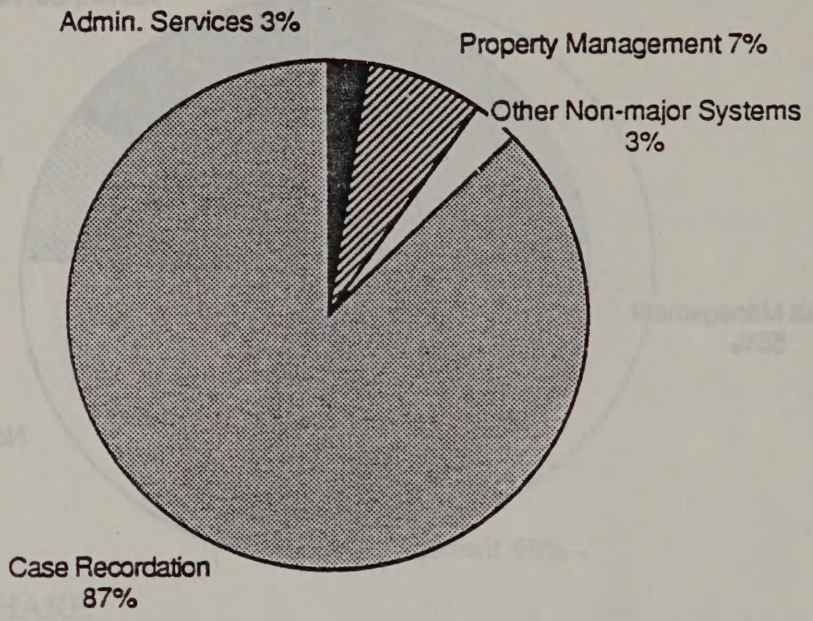


California Represents 2.4% of All DPS-8/70 CRUs.

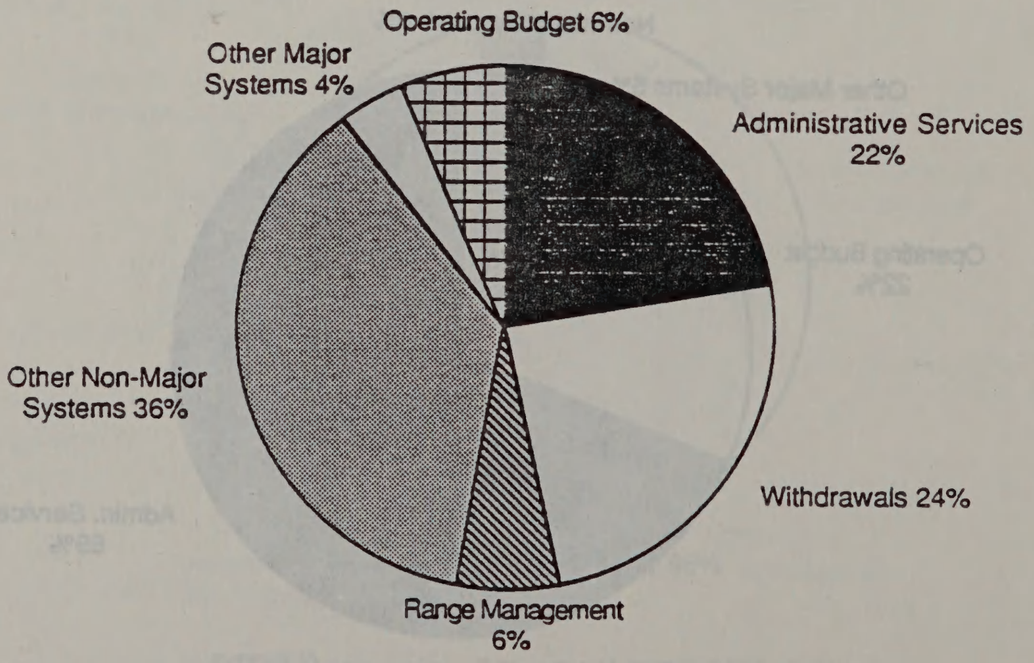
COLORADO STATE OFICE

Computer Resource Units for DPS-8/70
(October 1985 to February 1986)

BATCH
(20% of Total Colorado CRUs)



TIME SHARE
(80% of Total Colorado CRUs)

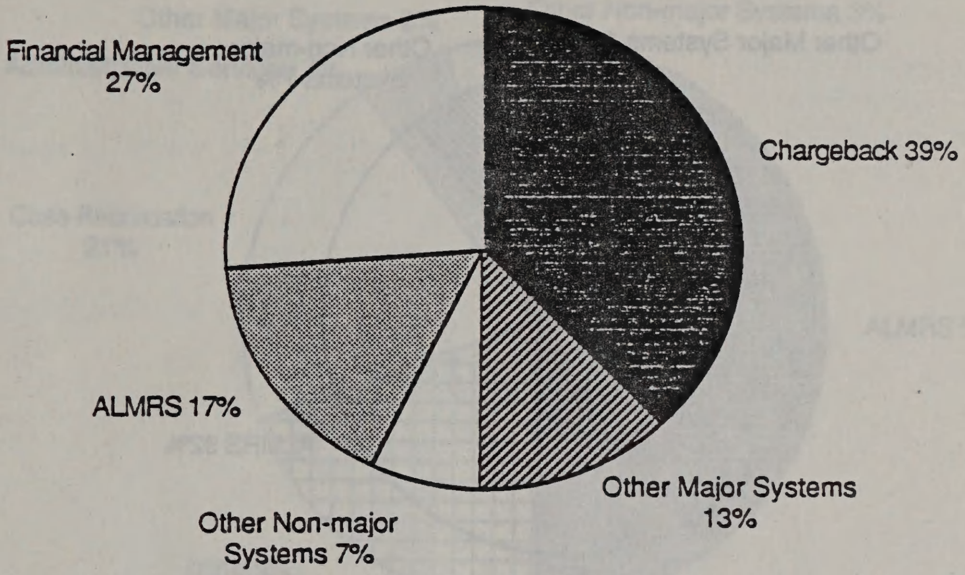


Colorado Represents 4.5% of All DPS-8/70 CRUs.

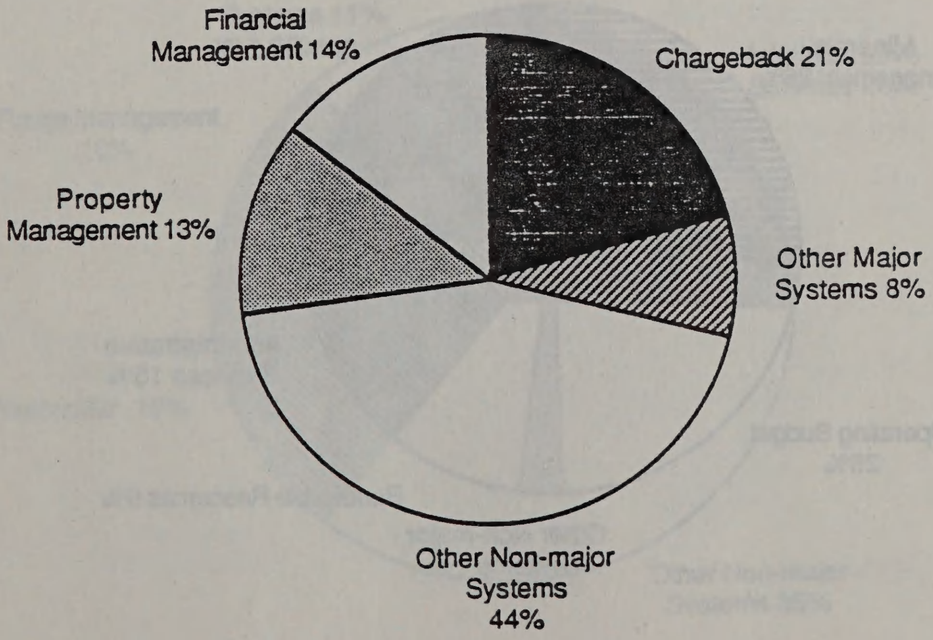
DENVER SERVICE CENTER

Computer Resource Units for DPS-8/70
(October 1985 to February 1986)

BATCH
(54% of Total DSC CRUs)



TIME SHARE
(46% of Total DSC CRUs)

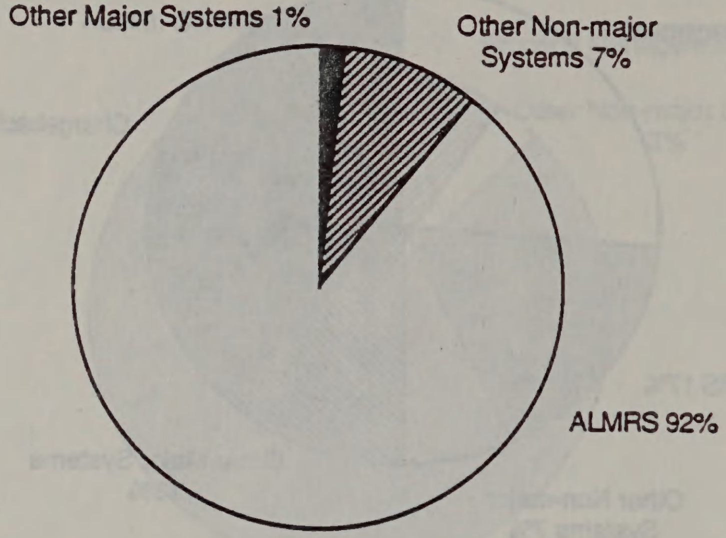


DSC Represents 48% of All DPS-8/70 CRUs.

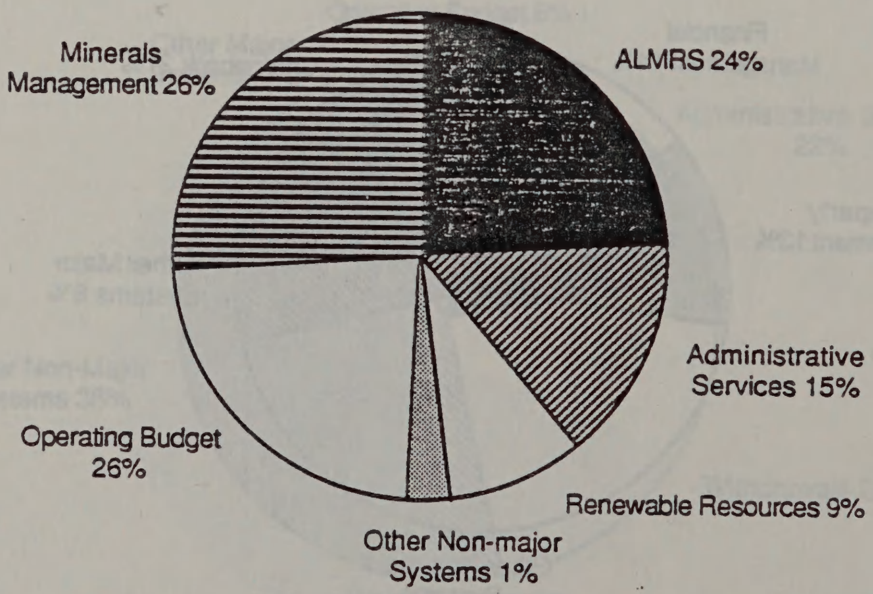
EASTERN STATES OFFICE

Computer Resource Units for DPS-8/70
(October 1985 to February 1986)

BATCH
(39% of Total ESO CRUs)



TIME SHARE
(61% of Total ESO CRUs)

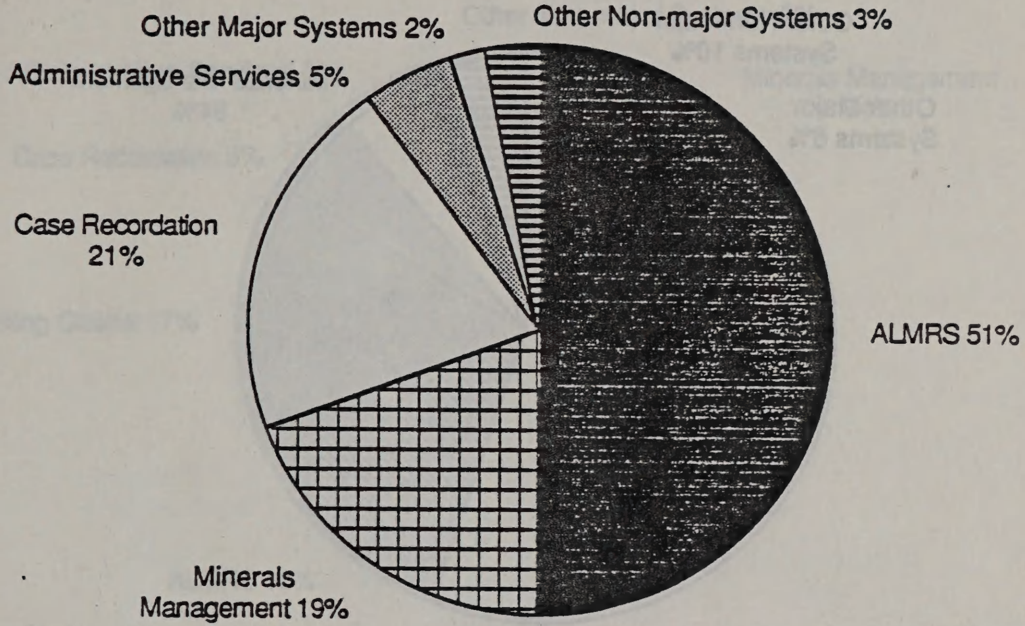


ESO Represents .3% of All DPS-8/70 CRUs.

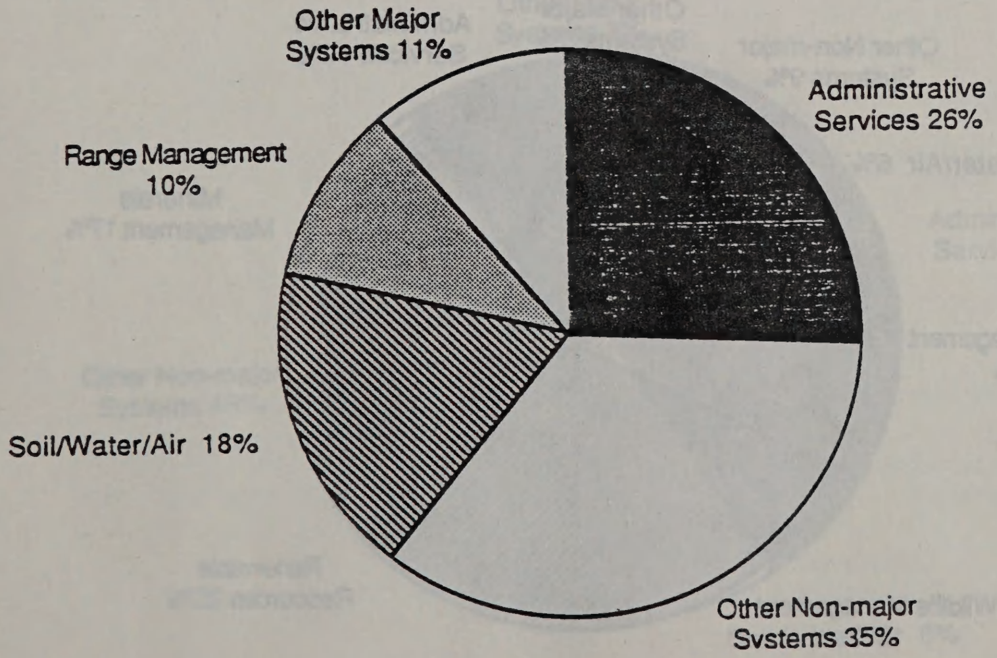
IDAHO STATE OFFICE

Computer Resource Units for DPS-8/70
(October 1985 to February 1986)

BATCH
(18% of Total Idaho CRUs)



TIME SHARE
(82% of Total Idaho CRUs)

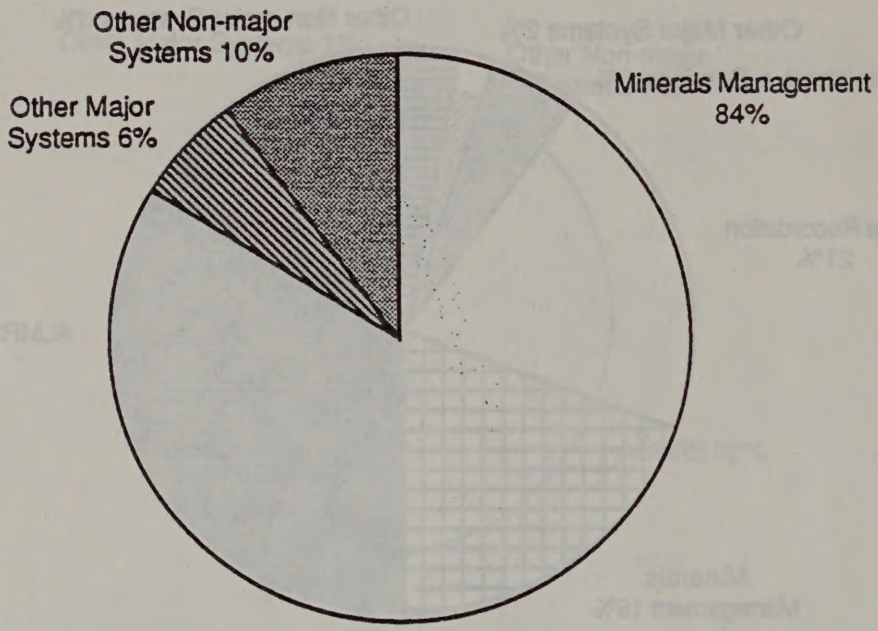


Idaho Represents 3% of All DPS-8/70 CRUs.

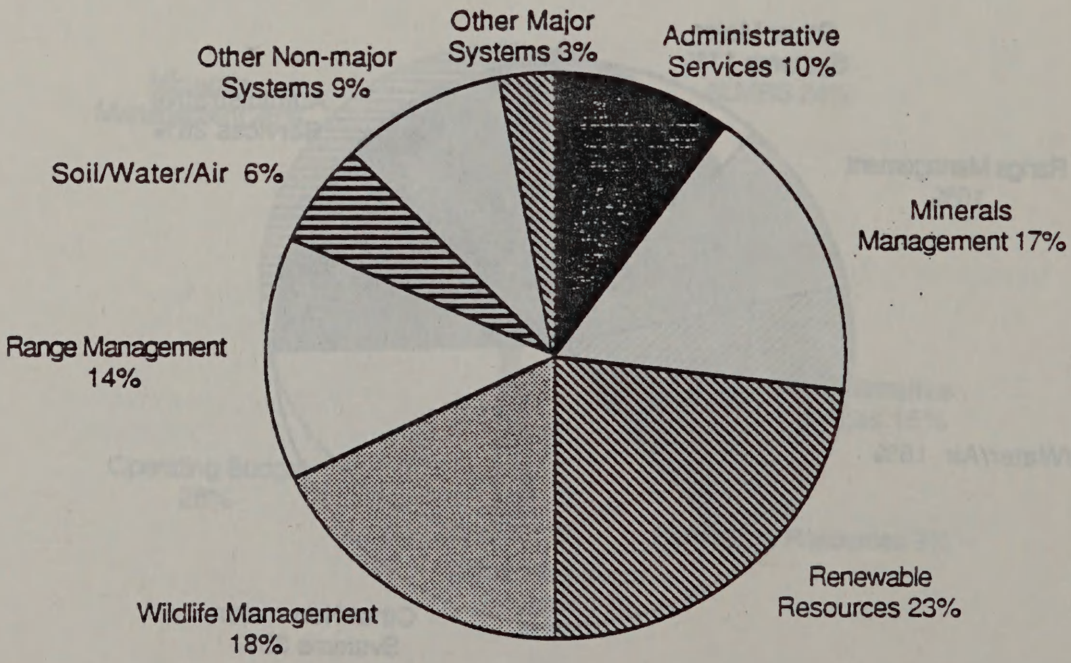
MONTANA STATE OFFICE

Computer Resource Units for DPS-8/70
(October 1985 to February 1986)

BATCH
(45% of Total Montana CRUs)



TIME SHARE
(55% of Total Montana CRUs)

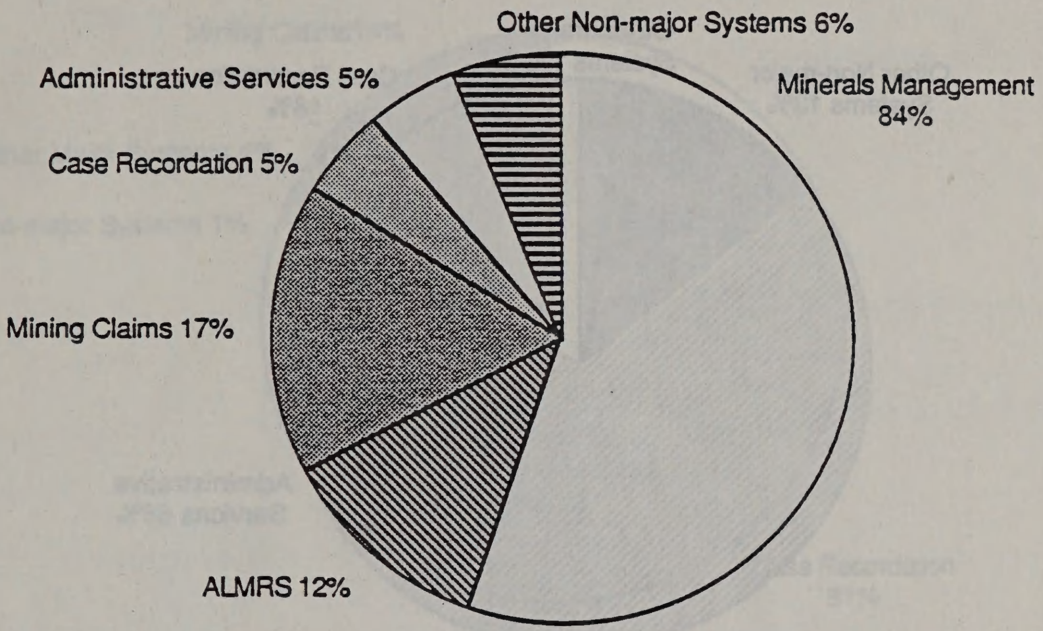


Montana Represents 5.3% of All DPS-8/70 CRUs.

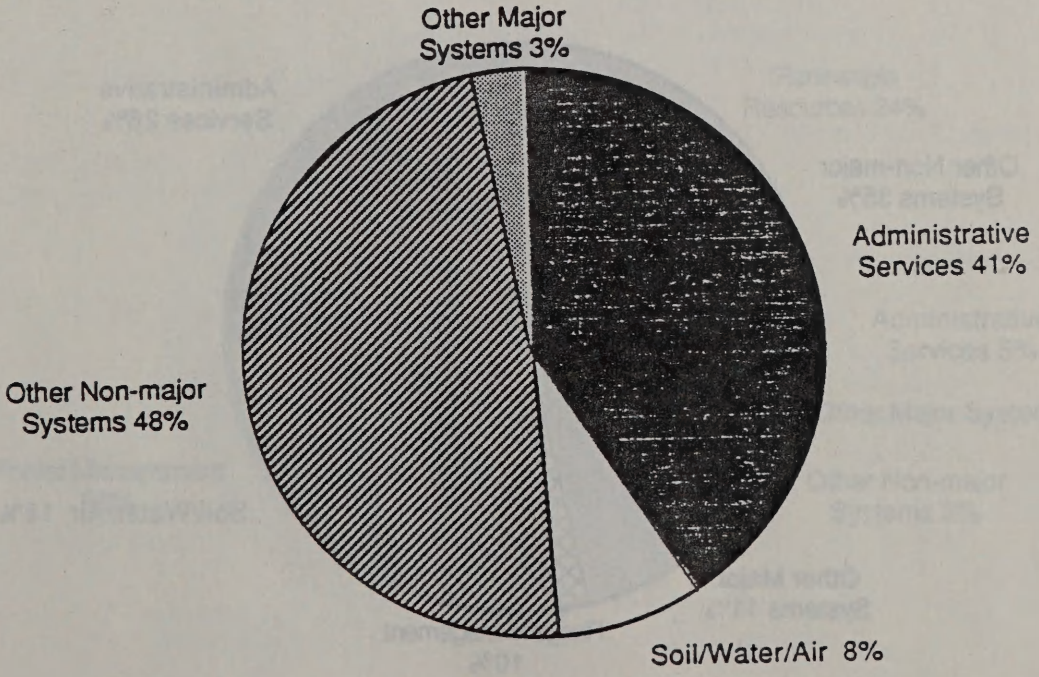
NEVADA STATE OFFICE

Computer Resource Units for DPS-8/70
(October 1985 to February 1986)

BATCH
(14% of Total Nevada CRUs)



TIME SHARE
(86% of Total Nevada CRUs)

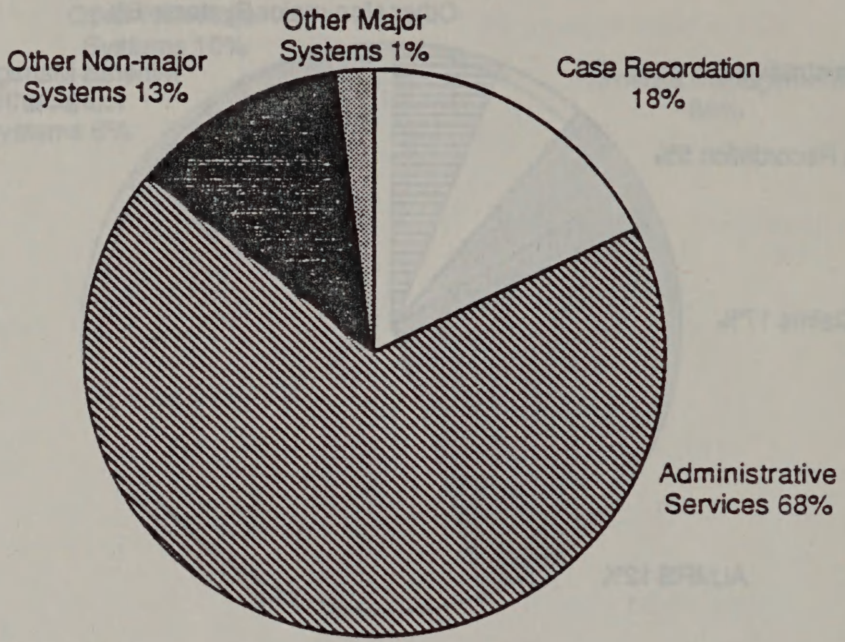


Nevada Represents 4.1% of All DPS-8/70 CRUs.

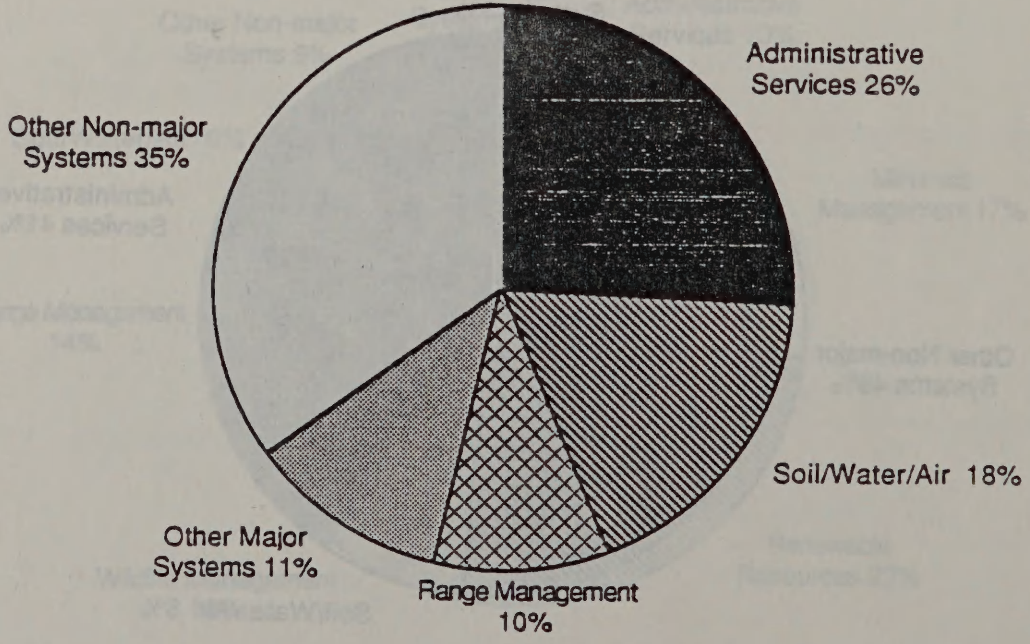
NEW MEXICO STATE OFFICE

Computer Resource Units for DPS-8/70
(October 1985 to February 1986)

BATCH
(26% of Total New Mexico CRUs)



TIME SHARE
(74% of Total New Mexico CRUs)

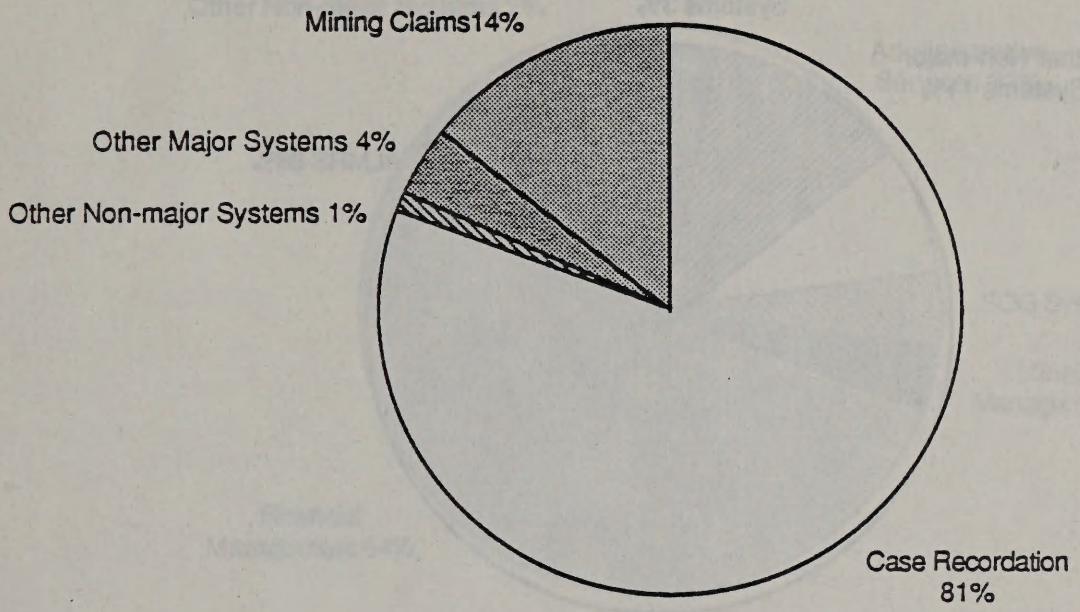


New Mexico Represents 4.5% of All DPS-8/70 CRUs.

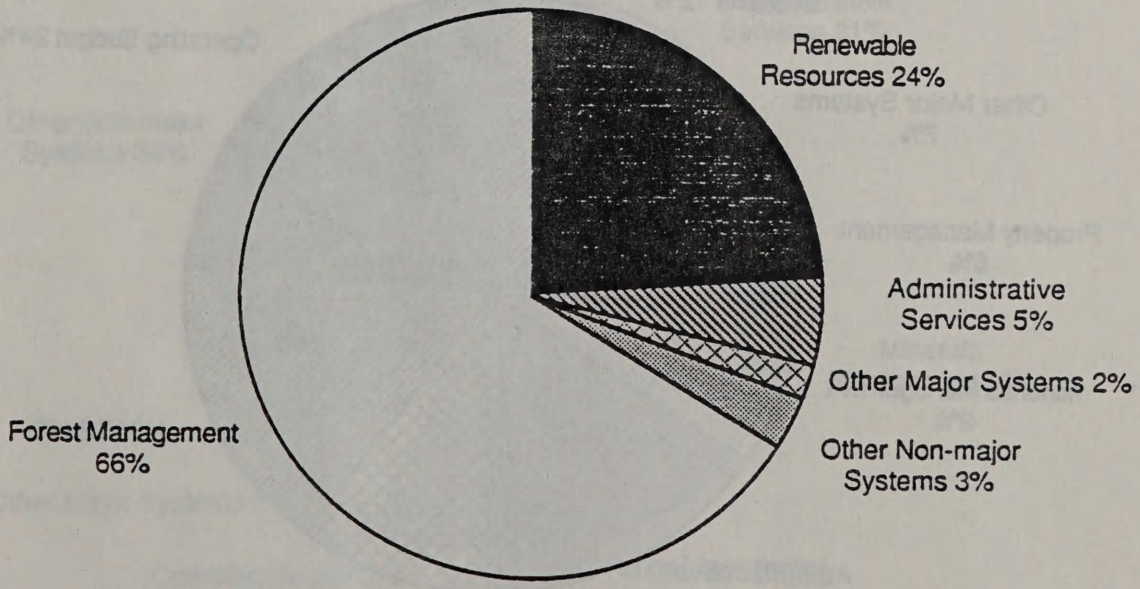
OREGON STATE OFFICE

Computer Resource Units for DPS-8/70
(October 1985 to February 1986)

BATCH
(3% of Total Oregon CRUs)



TIME SHARE
(97% of Total Oregon CRUs)

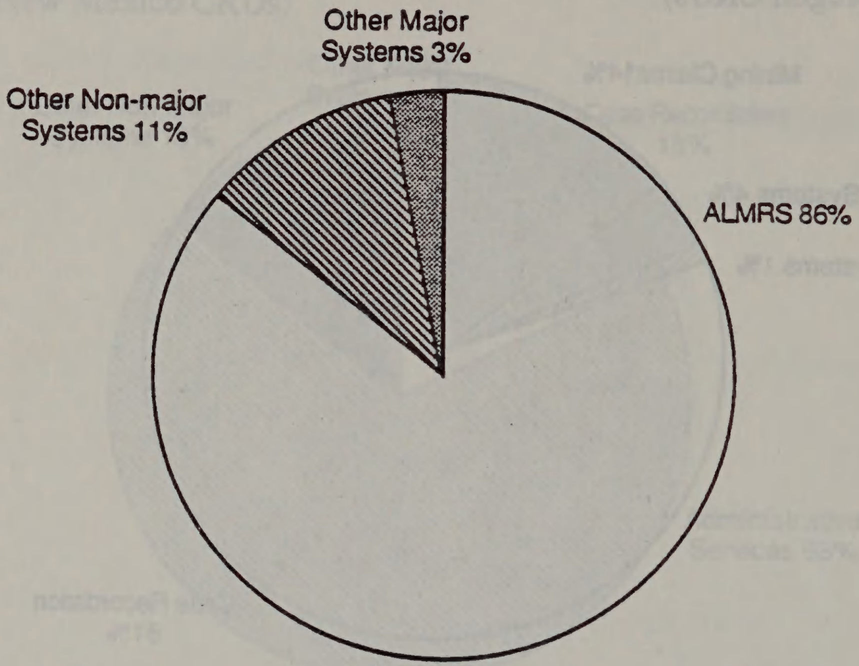


Oregon Represents 12.5% of All DPS-8/70 CRUs.

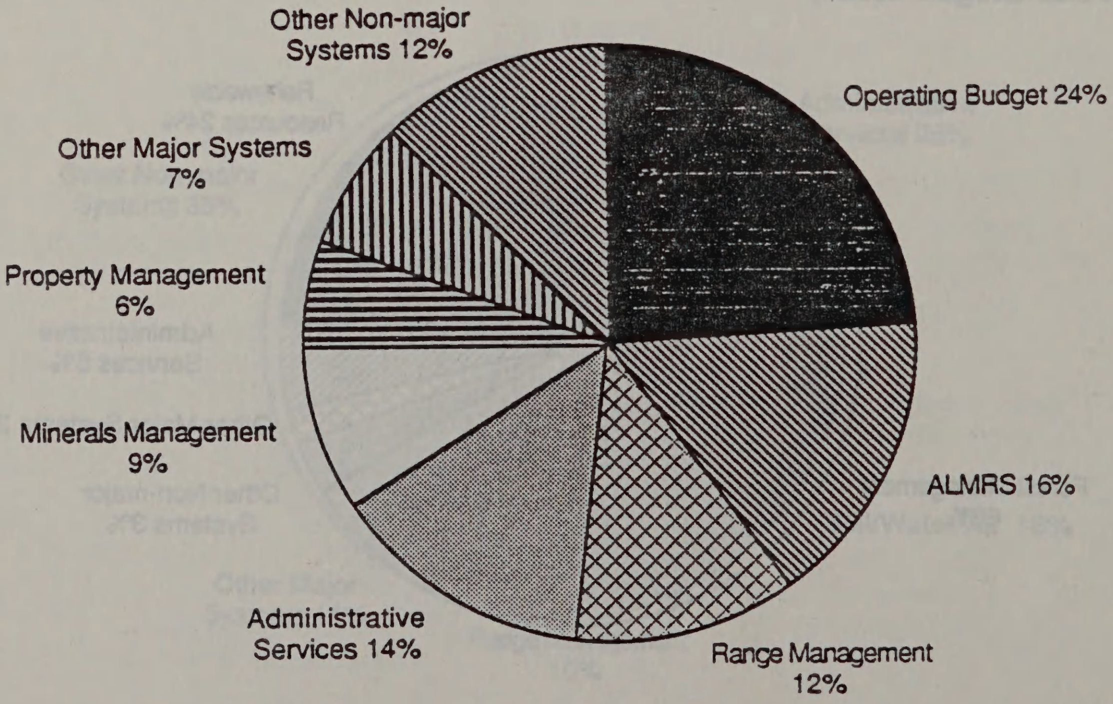
UTAH STATE OFFICE

Computer Resource Units for DPS-8/70
(October 1985 to February 1986)

BATCH
(73% of Total Utah CRUs)



TIME SHARE
(27% of Total Utah CRUs)

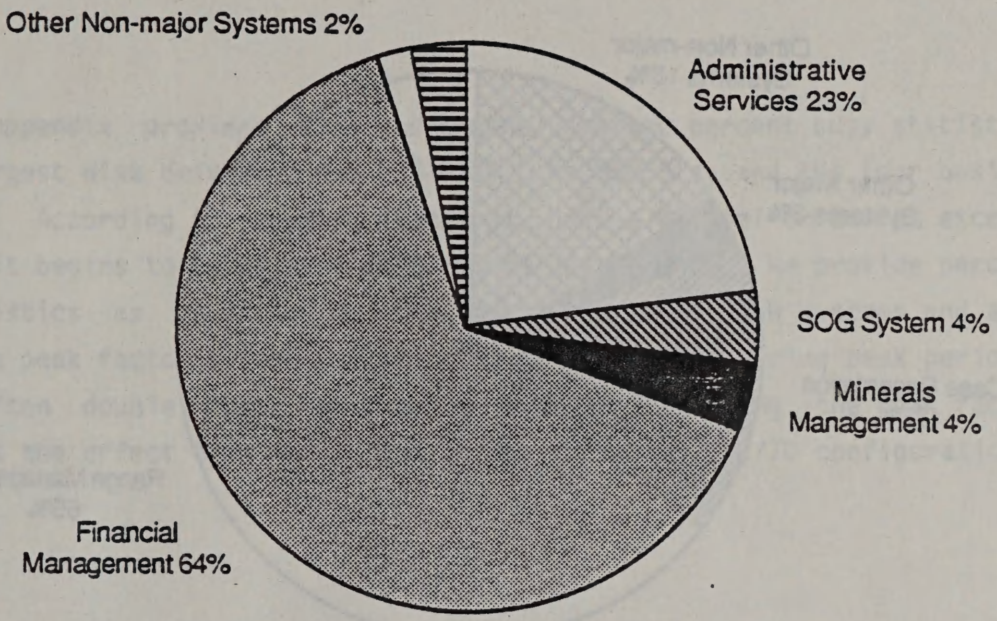


Utah Represents 2.8% of All DPS-8/70 CRUs.

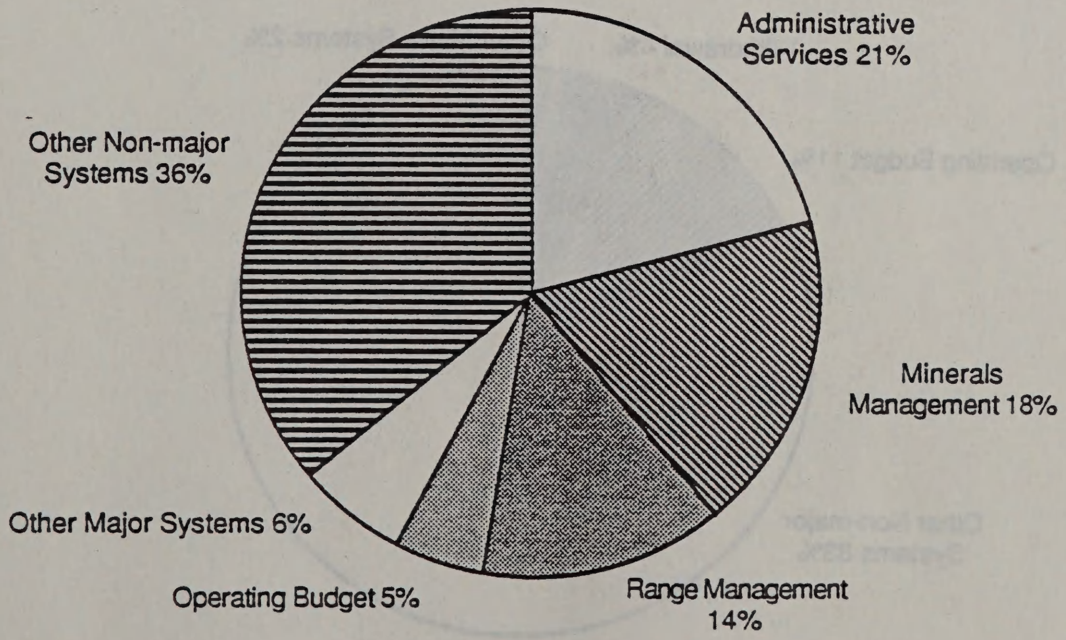
WYOMING STATE OFFICE

Computer Resource Units for DPS-8/70
(October 1985 to February 1986)

BATCH
(73% of Total Wyoming CRUs)



TIME SHARE
(27% of Total Wyoming CRUs)

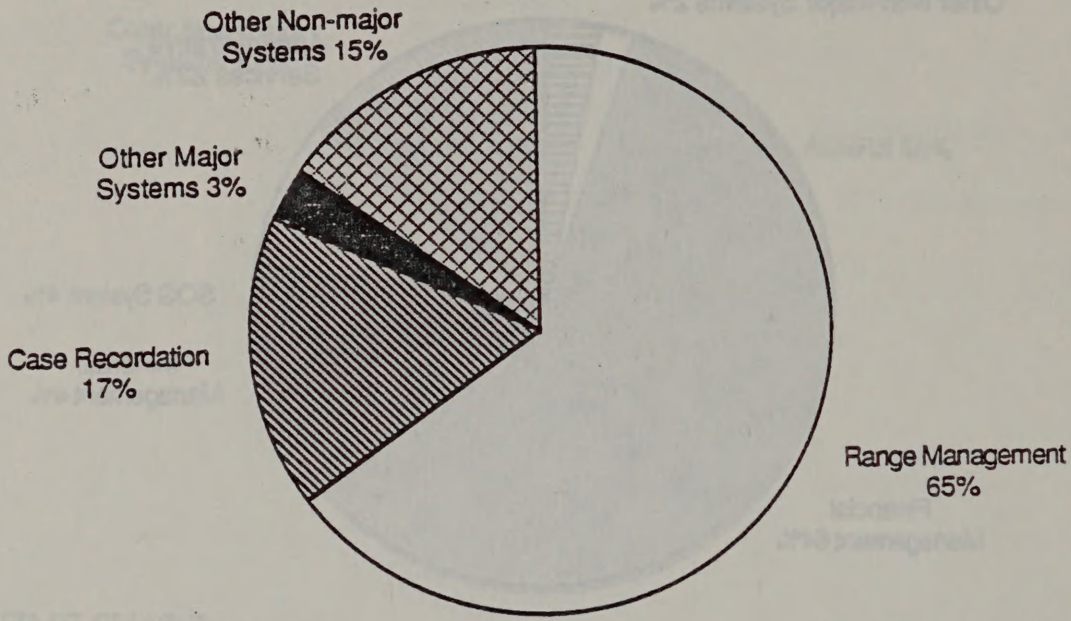


Wyoming Represents 7.3% of All DPS-8/70 CRUs.

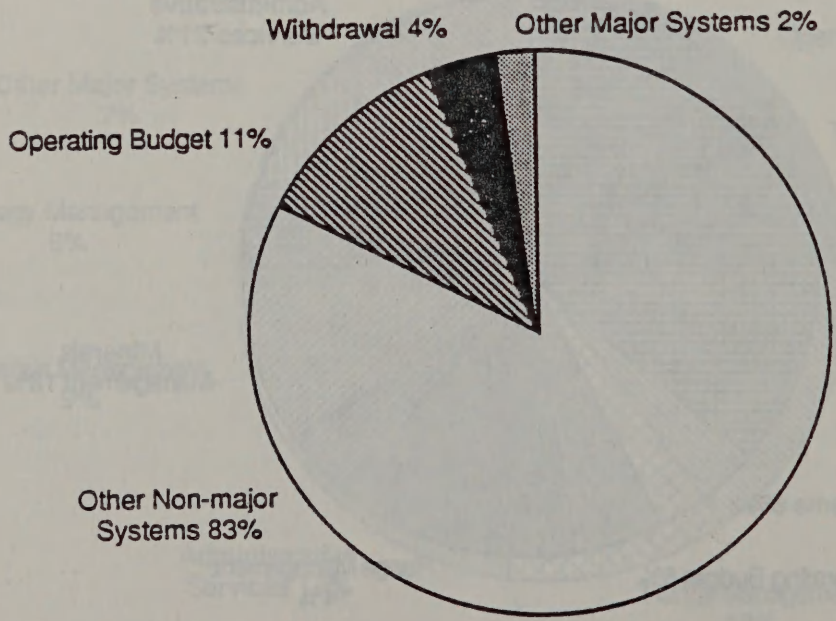
WASHINGTON OFFICE

Computer Resource Units for DPS-8/70
(October 1985 to February 1986)

BATCH
(38% of Total Washington CRUs)



TIME SHARE
(62% of Total Washington CRUs)



Washington Represents 3.3% of All DPS-8/70 CRUs.

APPENDIX G

DPS-8/70 DISK AND CHANNEL UTILIZATION
(March 85 Through February 86)

This appendix provides disk and channel average percent busy statistics for the largest disk drives on the DPS-8/70, the MSU501s, and the four busiest channels. According to industry standards, once a channel or device exceeds 35% busy it begins to experience performance degradation. We provide percent busy statistics as reported by the Chargeback and SARA-H systems and also including a peak factor of two to estimate peak periods. During peak periods, devices often double their average utilization. Using the peak factor illustrates the effect this would have on the current DPS-8/70 configuration.

DPS-8/70 Statistics
Disk and Channel Percent Busy by Month
(average over all three shifts)

	3/85	4/85	5/85	6/85	7/85	8/85	9/85	10/85	11/85	12/85	1/86	2/86	Average
Channel													
010	32.52	12.79	9.7	12.25	10.95	7.56	14.78	18.4	8.84	8.16	7.47	12.86	13.02
016	82.42	31.35	23.6	14.8	18.09	32.97	50.83	53.51	32	37.51	37.85	38.81	37.81
020	18.63	20.77	23.53	23.32	23.19	24.39	27.26	28.01	21.75	20.63	20.44	24.53	23.04
116	14.56	25.88	39.4	48.34	39.05	32.57	41.38	40.81	35.44	33.59	35.56	48.5	36.26
Device Address and Type													
01607 MSU501 DISK	0.98	0.2	5.58	0.71	3.4	17.87	26.64	26.61	17.23	20.2	12.17	12.8	12.03
01613 MSU501 DISK	24.38	*	*	*	*	*	*	*	*	*	*	*	24.38
01616 MSU501 DISK	18.65	7.2	*	*	*	*	*	*	*	*	*	*	12.93
11616 MSU501 DISK	*	3.92	10.58	17.12	13.23	13.31	22.09	25.26	21.9	23.04	17.36	20.43	17.11
11624 MSU501 DISK	*	0.79	11.29	6.96	4.58	14.62	8.09	8.02	2.57	4.48	10.66	10.65	7.52

DPS-8/70 Statistics
Disk and Channel Percent Busy by Month
(average over all three shifts)

Using Peak Factor of
2 x's Average

	3/85	4/85	5/85	6/85	7/85	8/85	9/85	10/85	11/85	12/85	1/86	2/86	Average
Channel													
010	65.04	25.58	19.40	24.50	21.90	15.12	29.56	36.80	17.68	16.32	14.94	25.72	26.05
016	164.84	62.70	47.20	29.60	36.18	65.94	101.66	107.02	64.00	75.02	75.70	77.62	75.62
020	37.26	41.54	47.06	46.64	46.38	48.78	54.52	56.02	43.50	41.26	40.88	49.06	46.08
116	29.12	51.76	78.80	96.68	78.10	65.14	82.76	81.62	70.88	67.18	71.12	97.00	72.51
Device Address and Type													
01607 MSU501 DISK	1.96	0.40	11.16	1.42	6.80	35.74	53.28	53.22	34.46	40.40	24.34	25.60	24.07
01613 MSU501 DISK	48.76	*	*	*	*	*	*	*	*	*	*	*	48.76
01616 MSU501 DISK	37.30	14.40	*	*	*	*	*	*	*	*	*	*	25.85
11616 MSU501 DISK	*	7.84	21.16	34.24	26.46	26.62	44.18	50.52	43.80	46.08	34.72	40.86	34.23
11624 MSU501 DISK	*	1.58	22.58	13.92	9.16	29.24	16.18	16.04	5.14	8.96	21.32	21.30	15.04

BLM Library
D-553A, Building 50
Denver Federal Center
P. O. Box 25047
Denver, CO 80225-0047

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D-553A, Building 50
Denver Federal Center
P. O. Box 25047
Denver, CO 80225-0047

BLM Library
D-553A, Building 50
Denver Federal Center
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Denver, CO 80225-0047